

Eastern Archipelago. Part 1: Eastern part

Great Britain.
Hydrographic Dept



(To be inserted on inside cover of all Sailing Directions.)

CAUTION WHEN APPROACHING BRITISH PORTS.

My Lords Commissioners of the Admiralty, having taken into consideration the fact that circumstances may arise in which it might be necessary on account of periodical exercises, manœuvres, or otherwise, to forbid all entrance to the naval ports at night, this is to give Notice that on approaching the shores of Great Britain, or any British dependency, if search lights are observed to be in constant operation, the Naval harbours should be approached with great caution, as it may be apprehended that obstructions may exist outside the port, or that the entrances may be altogether closed, and the examination service may be in force.

To signify that an entrance is closed, three *red* vertical lights will be exhibited in some conspicuous position in or near the approach to a port, and as far as possible Notice of the fact will be given by "lookout" vessels in the offing.

Agent for the sale of Admiralty Charts, MR. J. D. POTTER, 145, Minories, London, E.

KPdl
18⁵⁰

(To be inserted in page next Cautionary Notice in all Sailing Directions.)

**NOTATIONS OF SUPPLEMENTS OR
HYDROGRAPHIC NOTICES RELATING TO
THIS BOOK.**

To be filled in by Navigating Officer.

[In Chart Depôts the two first columns are alone to be filled up.]

Whether Supplement or Hyd. Notice.	Date of Publication and Number.	Whether pasted in or noted in Margins of Book, and Date of such Correction.

EASTERN ARCHIPELAGO,

PART I.

(EASTERN PART),

COMPRISING

THE PHILIPPINES, SULU SEA, SULU
ARCHIPELAGO, N.E. COAST OF BORNEO,
CELEBES SEA, N.E. COAST OF CELEBES,
MOLUCCA AND GILLOLO PASSAGES, BANDA
AND ARAFURA SEAS, N.W. AND WEST
COASTS OF NEW GUINEA, AND NORTH
COAST OF AUSTRALIA.

COMPILED FROM VARIOUS SOURCES BY
CAPTAIN J. P. MACLEAR, R.N.

SECOND EDITION,
1902.

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1902.

Price Four Shillings.

and the officers of the *Nassau*, 1871-1873, and the voyage of the *Challenger*, 1874-1875. Additional information relating to the coasts and ports of the Philippines, is continually being gathered by the American officers serving in those waters, much of which is incorporated in the Second Edition.

The Geographical positions of the principal points of the Philippine islands had been well determined in 1852 by Captain D. Cláudio Montero, of the Spanish navy, by a system of triangulation extending from the Babuyan islands, north of Luzon, along the western coasts of the Philippines to the southern coast of Mindanao, the longitudes being referred to the meridian of the Cathedral at Manila. Much, however, of the coast line between the points remains to be filled in, especially of the islands of Panay, Negros, and Mindanao, and these coasts must be approached with caution.

In 1834 the Spanish Hydrographic Commission was instituted, and under its first chief, Captain Halcon, the coast of Luzon, between latitude $13^{\circ} 15' N.$ and $16^{\circ} 0' N.$ was surveyed. The work of the Commission, interrupted for some time by the necessity of action against the pirates of Sulu, was resumed in 1850, when Captain D. Cláudio Montero surveyed the Kalamianes and connected his survey with that of Paláwan island by Captain Bate, R.N. The Commission has since completed the survey of the Sulu Archipelago in connection with the work of H.M.S. *Nassau* in 1871-1873.

In the earlier surveys, the Eastern coast of Luzon, from cape Ildefonso to San Bernardino strait, was traced by the expedition under Malaspina and Maqueda in 1792-1793, and later in 1830 the coast of Albay and Tabako was surveyed by Señor Vargas. This entire coast, as well as the strait of San Bernardino, sketched by Captain Vernacoi in 1804, can only be considered as laid down approximately. The coast of Sebu island, Tañon strait and the north coast of Mindanao, sketched by Señor Campo, were also among the earlier surveys, and can only be considered as approximately laid down.

The eastern coast of Samar, Leite, and Mindanso have been laid down from anonymous charts in which little reliance is to be placed; nor is the south coast of Mindanao, between Mindanao river and cape San Agustin, known with any certainty.

The Sailing Directions for the Kalamianes and Cuyos islands have been taken from the Derrotero with the addition of the information already published in the China Sea Directory, Vol. II., from the Surveys of Commander Bate and Captain Maclear, R.N.; and for the Sulu sea from the surveys of H.M.S. *Nassau*, 1871-1873; and for the Sulu archipelago

from the above survey of the *Nassau*, with additions from the surveys of the Spanish Government, published in the *Derrotero* of 1879 and its annual supplements. Horsburgh's Directory, the Nautical and Mercantile Magazines, and the Remark Books of H.M. ships have also been consulted.

The Sailing Directions for Balábac strait and the channels between Paláwan and Borneo, and part of the north-east coast of Borneo, including Mallawallé channel, are from the surveys of Staff-Commander Reed and the officers of the *Rifleman*, 1868-1870; for the north-east coast of Borneo and off-lying islands and reefs and Sandakan harbour, from the surveys of H.M. ships *Samarang*, 1844-1849, *Nassau*, 1871-1872, *Flying Fish*, 1881, *Magpie*, 1883, and *Rambler*, 1889. The coast to the southward of Unsang peninsula, including Darvel bay, Sibuko bay, the Sibutu islands and reefs, and the Ligitan islands and reefs, were surveyed by H.M.S. *Egeria*, 1891-92.

The Sailing Directions for the Moluccas have been compiled mainly from Horsburgh's Directory and the "Moluksche Archipel," with additions from the voyage of the *Challenger*, the Remark Books of officers of H.M. ships *Serpent* and *Nassau*, and the surveys of H.M.S. *Flying Fish*, 1885; from Wallace's "Malay Archipelago" and the "Cruise of the *Marchesa*," Findlay's Sailing Directions for the Indian Archipelago, the French "Instructions Nautiques sur le Grand Archipel d'Asie," and the Nautical and Mercantile Marine magazines have also been consulted.

The Sailing Directions for the Banda and Arafura seas have been compiled from Horsburgh's Directory, the "Moluksche Archipel," "Voyages through the Moluccan archipelago and to New Guinea," by Lieut. Kolff, of the Dutch navy, and from the surveys of H.M. ships *Challenger*, 1874, and *Flying Fish*, 1885.

The Sailing Directions for the north-west and west coasts of New Guinea are from Horsburgh's Directory, Findlay's "Indian Archipelago," 3rd Edition, Kolff's "Voyage through the Moluccan Archipelago and to New Guinea," the "Moluksche Archipel," the "Cruise of the *Marchesa*," and from the Hydrographic notices issued by the Admiralty.

No connected survey has been made of these coasts; our knowledge of them is derived from many isolated expeditions touching at various points, and the longitudes of the principal points are open to great doubt. The north coast of Waigiu island was surveyed by Captain Forrest in 1775, and by D'Urville in 1827; Dampier strait and the north coast of New Guinea was explored by Dampier in 1700, and McCluer in 1791; later additions to our knowledge have been made by Sir E. Belcher in 1840, Captain Moresby in 1875, and the U.S. sloop *Alert* in 1877. Battanta and Salwatti islands are known from the "Cruise of the yacht *Marchesa*"

in 1883. Selé strait was explored by Signor Cerruti in 1870, and the German frigate *Gazelle* in 1875. McCluer inlet was mapped by McCluer in 1791, Segaar and Patippi bays by the officers of the German vessel of war *Gazelle* in 1875. Alexandra and Freshwater bays were examined by Signor Cerruti and Captain di Lenna in 1870. Kamrau bay was explored by the Dutch steamer *Etna* in 1857. The coast from Triton bay to Prince Frederick Henry island was explored by Lieut. Kolff in 1825, Lieut. Modera in 1828, Lieut. Kool in 1835, and by D'Urville in 1839. Besides the above, many scientific expeditions have been sent by the Dutch Government.*

The Sailing Directions for the North coast of Australia are from the survey by Captain Stokes, R.N., 1838-1842, already published in Australia Directory, Vol. III., and from the late surveys of Popham bay, cape Don, and Clarence strait by Captain Maclear, R.N., 1885, and of port Darwin by Commander Hoskyn, R.N., 1885.

The first edition was compiled in 1890, by Captain J. P. Maclear, R.N., from various sources, an account of which has been given above. The present edition, prepared by Captain John Phillips, R.N., contains all the information received since 1890, including especially the remarks of Commander A. M. Field, R.N., H.M.S. *Egeria*, employed surveying on the north-east coast of Borneo, 1891-92, and much useful information furnished by Naval Officers of the United States relating to the coasts and ports of the Philippine islands.

Seamen are invited to transmit to the Secretary of the Admiralty notice of any errors or omissions they may discover, or additional information they may obtain, with a view to the improvement of this work and for the benefit of the mariner.

By the publication of this work, the former edition, as well as Supplements, or Hydrographic Notices relating to them, also Notices to Mariners up to and including No. 371 of 1902, are cancelled.

W. J. L. W.

Hydrographic Office, Admiralty, London.
July 1902.

* A complete paper on the Progress of Discovery on the coasts of New Guinea, with Bibliographical index, was published in 1884 by the Royal Geographical Society. See Supplementary papers, Vol. I., part 2.

CONTENTS.

INTRODUCTORY.

	Page
Advertisement.—Principal Authorities - - - - -	iii
Glossary of a few native words - - - - -	xi
System of Orthography - - - - -	xv-xviii
Information relating to Charts, Sailing Directions, and the general navigation of H.M. Ships - - - - -	xix-xxx
Index Chart - - - - -	facing page 1

CHAPTER I.

General remarks on the various islands - - - - -	1-12
Winds and weather; typhoons; hurricanes - - - - -	12-22
Currents and tides - - - - -	22-28
Coal; communication - - - - -	28-30
Passages - - - - -	30-39

CHAPTER II.

West coast of Luzon - - - - -	42-72
West coast of Mindoro island; Mindoro strait - - - - -	72-81
Sulu sea; Cuyos islands; Kagayan islands - - - - -	82-95
Basilan strait - - - - -	95-101

CHAPTER III.

SULU ARCHIPELAGO.

Basilan island; Samales group - - - - -	102-110
Sulu group; Tapul group - - - - -	110-123
Tawi Tawi group; Pangutarang group - - - - -	124-143

CHAPTER IV.

NORTH-EAST COAST OF BORNEO FROM BANGUEY ISLAND TO SIBUKO RIVER.

Balábac strait; Banguey channels	-	-	-	-	-	-	144-160
Mallawallé channel; Sandakan	-	-	-	-	-	-	160-176
Sibutu islands and passages	-	-	-	-	-	-	177-181
Darvel bay; Sibuko bay	-	-	-	-	-	-	181-220

CHAPTER V.

Verde island passage to Iloilo, Western route	-	-	-	-	-	221-246
---	---	---	---	---	---	---------

CHAPTER VI.

Verde island passage to Iloilo, Eastern route	-	-	-	-	-	247-270
---	---	---	---	---	---	---------

CHAPTER VII.

Negros island; Sebu island	-	-	-	-	-	-	271-289
Bohol island; Leite	-	-	-	-	-	-	290-302
Mindanao, N.E. coast; Surigao strait	-	-	-	-	-	-	303-312
Mindanao, north and west coasts	-	-	-	-	-	-	312-324

CHAPTER VIII.

VERDE ISLAND PASSAGE TO SAN BERNARDINO AND SAN JUANICO STRAITS.

South coast of Luzon; Marinduque and Burias islands	-	-	-	-	-	325-337
South coast of Luzon; Tikao and Masbate islands	-	-	-	-	-	337-347
San Bernardino strait; Samar island, San Juanico strait	-	-	-	-	-	348-363

CHAPTER IX.PageEASTERN COASTS OF THE PHILIPPINE ISLANDS.

North and east coasts of Luzon	-	-	-	-	-	-	364-384
East coasts of Samar and Mindanao	-	-	-	-	-	-	384-391

CHAPTER X.CELEBES SEA ; BASILAN STRAIT TO MOLUCCA PASSAGE.

Mindanao island, south coast	-	-	-	-	-	-	392-406
Islands between Mindanao and Celebes island	-	-	-	-	-	-	406-415
N.E. end of Celebes island	-	-	-	-	-	-	416-426

CHAPTER XI.MOLUCCA AND GILLOLO PASSAGES TO BANDA ISLES.

Molucca and Gillolo passages	-	-	-	-	-	-	427-449
Pitt passage ; Buru and Ceram islands	-	-	-	-	-	-	449-466
Banda islands	-	-	-	-	-	-	466-468

CHAPTER XII.BANDA SEA.

Banda sea ; Ké and Aru islands	-	-	-	-	-	-	469-485
Serwatti and Tenimber islands	-	-	-	-	-	-	486-496

CHAPTER XIII.NEW GUINEA.

North-west peninsula of New Guinea ; islands off it	-	-	-	-	-	-	497-507
North-west and west coasts of New Guinea	-	-	-	-	-	-	508-529

CHAPTER XIV.ARAFURA SEA, AND NORTH COAST OF AUSTRALIA.

Arafura sea	-	-	-	-	-	-	522-525
De Courcy head to Melville island	-	-	-	-	-	-	525-554
Port Darwin and its approaches	-	-	-	-	-	-	554-564

	<u>Page</u>
<u>Appendix.—Tides of the Philippine islands, remarks extracted from the</u> <u>Spanish Derrotero; tables for finding time and height of high-water at</u> <u>Manila bay, Balábac, and Iloilo; tables for finding time and height of</u> <u>high-water on the south coast of Mindanao</u>	- - - - 565-571
<u>Appendix.—Weather tables</u>	- - - - - 572-574
<u>Index</u>	- - - - - 575-623
<u>List of Sailing Directions, &c., published by the Hydrographic Department</u> <u>of the Admiralty</u>	- - - - - 625-630
<u>Admiralty Agents for the sale of Charts in the United Kingdom and abroad</u>	631-632

GLOSSARY OF NATIVE WORDS FREQUENTLY OCCURRING
IN THE CHARTS AND SAILING DIRECTIONS.

Abacá (Tagala)	- Manila hemp.	Kogonal	- - A thicket or plantation of Kogon.
Alimpaya (Bisayan)	- Tide race, eddies.	Kolai (Bisayan)	- A resinous tree.
Balate (Tag. and Bis.)	The Indian fig.	Kota -	- A fort.
Balete (Tag. and Bis.)	Bêche de Mer.	Masila (Moro)	- Great.
Bantiki (Tag. and Bis.)	A tree resembling olive.	Mis or Mios (New Guinea)	- - Island.
Carey or Karei (Tag. and Bis.)	- Turtle shell.	Parido (Moro)	- Small.
Dako (Bisayan)	- Great.	Salanganes	- - Edible birds nests.
Ef (Misol)	- - Island.	Si (Malay)	- - A particle inseparably united to nouns, and denoting familiarity.
Gusong (Malay)	- A reef of rocks.	Sibukao (Tagala)	- Sappan wood.
Kapis (Tagala)	- Pearl shell.	Sugur (Moro)	- A bay.
Kasiran (Moro)	- Native paddy.	Talisi (Tag. and Bis.)	A useful tree— <i>Terminalia Cattappa</i> .
Kauit (Tag. and Bis.)	A creek, a bend, a hook; frequently employed to name a point.	Trumbu (Malay)	- A dangerous hidden shoal.
Kelong (Tagala)	- A large oyster.	Wai (Buru)	- - A river.
Kilong (Tagala)	- Fish stakes.		
Kima (Tagala)	- A large clam.		
Kogon (Tag. and Bis.)	A reed used for roofing houses—the <i>Allang Allang</i> of the Moluccas.		

GLOSSARY OF A FEW USEFUL GEOGRAPHICAL AND SEA
TERMS IN THE MALAY AND TAGALA LANGUAGES.

English.	Malay.	Tagala.
Anchor - - -	Sawuh - - -	Sao.
Anchorage - - -	Labuan - - -	
Banana - - -	Pisang - - -	Saguing.
Bay - - -	Teluk - - -	Luk.
Bird - - - {	Barung - - - Manuk (Jav.) - - -	Ibon.
Black - - -	Itam - - -	Maitim.
Calm - - -	Tedoh - - -	Kalinauan.
Cane (bamboo) - - -	Buluh, Bambu - - -	Kauayan.
— (rattan) - - -	Kotan - - -	
— (sugar) - - -	Tebu - - -	Tubu.
Cape, point - - - {	Tanjong - - - Ujong (Jav.) - - -	Ongot.
Channel - - -	Trusan - - -	
Coal - - -	Arang - - -	
Coast (dry land) - - -	Darat - - -	
— (seaboard) - - -	Pantei, Tepilaut - - -	Baibai.
Cocoa-nut - - -	Kalapa - - -	Niyog.
Compass (Mariners') - - -	Padoman - - -	
North - - -	Utara - - -	Hilaga.
East - - -	Timur - - -	Silangan.
South - - -	Salatan - - -	Habagat.
West - - -	Barat - - -	Kalonoran.
Coral - - -	Karang - - -	
Current - - -	Aras - - -	Agos.
Deep - - -	Dalam - - -	Malalim.
Dry - - -	Kring - - -	Tuyo.
Fire - - -	Api - - -	Apui.
Fish - - -	Ikan - - -	Isda.
Fruit - - -	Buwah - - -	Bunga.
House - - -	Rumah - - -	Balai.

English.	Malay.	Tagala.
Iron - - -	Besi - - -	Bakal.
Island - - - {	Nusa (Jav.) Pulo - - -	} Poio.
Land - - -	Tanah - - -	Lupa.
Large, great - - -	Besar - - -	Malaki.
Little, small - - -	Kecil - - -	Munti.
Long - - -	Panjang - - -	Mahaba.
Low - - -	Rendah - - -	Mababa.
Mole, jetty - - -	Jembatan - - -	Pantalan.
Mountain - - -	Gunong - - -	Bondog.
Mouth, of a river - - -	Kawala - - -	Ilogan.
Mud - - -	Lumpur - - -	Losak.
Rice, in the straw - - -	Padi - - -	Palai.
River - - -	Sungai - - -	Ilog.
Road - - -	Jalan - - -	Daan.
Rock, stone - - -	Batu - - -	Bato.
Sail - - -	Layar - - -	Layag.
Salt - - -	Masin - - -	Asin.
Sand - - -	Pasir - - -	Bohangin.
Sea - - -	Laut - - -	Dagat.
Shallow - - -	Tohor - - -	Mababao.
Ship - - - {	Kapal Prau - - -	{ Darung. Balangai.
Shoal, sand - - -	Beting - - -	Takut.
Strait - - -	Selat - - -	Kitir.
Tide, ebb - - - {	Pasang surut turun - - -	} Dagat hibas.
—, flood - - -	— naik - - -	— Laki.
—, high - - -	— besar - - -	
—, low - - -	— kring - - -	— tagas.
Town - - -	Nagri - - -	Bayan.
Tree - - - {	Kayu Pohon - - -	} Kahui.
Water - - -	Ayer - - -	Tubig.
Wind - - -	Angin - - -	Hangin.

SYSTEM OF ORTHOGRAPHY.

Adopted by the Admiralty for Sailing Directions and Charts.

As far as has been found possible with existing knowledge, native names are spelt in accordance with the following system, which has been adopted by the principal authorities in Great Britain and by the United States, and has been for some years in process of gradual introduction into all Admiralty Sailing Directions and Charts.

No change is made in the orthography of foreign names in countries which use Roman Letters; thus French, Spanish, Portuguese, Dutch, &c. names will be spelt as by the respective nations.

1. Where native names have been so long written in a form which, though not in accordance with this system, has become familiar to English eyes from being so spelt in all charts and maps, they are retained.

2. The true sound of the word as locally pronounced is taken as the basis of the spelling.

3. An approximation of the sound is alone aimed at. A system which would attempt to represent the more delicate inflections of sound and accent would be so complicated as only to defeat itself.

4. The broad features of the system adopted are that vowels are pronounced as in Italian and consonants as in English, *every letter being pronounced*. Two accents only are used:—

(1.) The acute, to denote the syllable on which stress is laid. The use of this is very important, as the sounds of many names are entirely altered by the misplacement of this "stress."

(2.) The sign \sim over the letter U to denote the short sound of that vowel under certain circumstances. (*See table.*)

5. When two vowels come together, each one is sounded, though the result, when spoken quickly, is sometimes scarcely to be distinguished from a single sound, as in *ai, au, ei*.

The amplification of the rules is given on the following pages.

Information is invited as to the proper spelling of native names, so as to produce the nearest approximation to the true sound, by this system.

Letters.	Pronunciation and Remarks.	Examples.
a	<i>ah</i> , <i>a</i> as in <i>father</i> - - - -	Java, Banána, Somáli, Bari.
e	<i>eh</i> , <i>e</i> as in <i>benefit</i> ; <i>a</i> as in <i>fate</i> - - -	Tel-el-Kebír, Oléleh, Yezo, Lévúka, Peru.
i	English <i>e</i> ; <i>i</i> as in <i>ravine</i> ; the sound of <i>ee</i> in <i>beet</i> . Thus, not <i>Feejee</i> , but	Fiji, Hindi.
o	<i>o</i> as in <i>mote</i> - - - -	Tokyo.
u	long <i>u</i> as in <i>flute</i> ; the sound of <i>oo</i> in <i>boot</i> . <i>oo</i> or <i>ou</i> should never be employed for this sound. Thus, not <i>Zooloo</i> or <i>Zoulou</i> , but	Zulu, Sumatra.
	The shorter sound of the different vowels, when necessary to be indicated, can be expressed by doubling the consonant that follows. The sounds referred to are as follows:— The short <i>a</i> as in <i>fatter</i> , as compared with the long <i>a</i> as in <i>father</i> . The short <i>e</i> as in <i>better</i> , as compared with the long <i>e</i> as in <i>fate</i> . The short <i>i</i> as in <i>sinner</i> , as compared with the long <i>i</i> as in <i>ravine</i> . The short <i>o</i> as in <i>sobbing</i> , as compared with the long <i>o</i> as in <i>sober</i> . The short <i>u</i> as in <i>rubber</i> , as compared with the long <i>u</i> as in <i>rubric</i> .	Yarra, Tanna, Mecca, Jidda, Bouny.*
ũ	is the same short sound of <i>u</i> as is denoted by doubling the consonant following, but is used, and only used, where such doubling is impossible, as in case of words where <i>u</i> is followed by two different consonants, as in <i>Tüng</i> , pronounced as the English <i>tongue</i> . Doubling of a vowel is only necessary where there is a distinct repetition of the single sound.	Nuulúa, Oosima.
ai	English <i>i</i> as in <i>ice</i> - - - -	Shanghai.
au	<i>ow</i> as in <i>how</i> . Thus, not <i>Foochow</i> , but	Fuchau.
ao	is slightly different from <i>au</i> - - - -	Macao.
aw	when followed by a consonant or at the end of a word, as in <i>law</i> - - - thus	Cawnpore.

* The *y* is retained as a terminal in this word under rule 1. The word is given as a familiar example of the alteration in sound caused by the second consonant.

Letters.	Pronunciation and Remarks.	Examples.
ei	is the sound of the two Italian vowels, but is frequently slurred over, when it is scarcely to be distinguished from <i>ey</i> in the English <i>they</i> , or <i>ei</i> in <i>eight</i> .	Beirút, Beilul.
b	English <i>b</i> .	
c	is always soft, but is so nearly the sound of <i>s</i> that it should be seldom used. If <i>Celèbes</i> were not already recognised it would be written <i>Selèbes</i> .	Celèbes.
ch	is always soft as in <i>church</i> . - - -	Chingchin.
d	English <i>d</i> .	
f	English <i>f</i> . <i>Ph</i> should not be used for the sound of <i>f</i> . Thus, not <i>Haiphong</i> , but	Haifong, Nafa.
g	is always hard. (Soft <i>g</i> is given by <i>j</i>) -	Galápagos.
h	is always pronounced when used.	
hw	as in <i>what</i> ; better rendered by <i>hw</i> than <i>wh</i> , or <i>h</i> followed by a vowel. Thus, <i>Hwang ho</i> , not <i>Whang ho</i> , or <i>Hoang ho</i> .	Hwang ho, Ngan hwei.
	English <i>j</i> . <i>Dj</i> should never be put for this sound.	Japan, Jinchuen.
k	English <i>k</i> . It should always be put for the hard <i>c</i> . Thus, not <i>Corea</i> , but	Korea.
k	The Oriental guttural - - - -	Khan.
gh	is another guttural, as in the Turkish - -	Dagh, Ghazi.
l	} As in English.	
m		
n		
ng	has two separate sounds, the one hard as in the English word <i>finger</i> , the other as in <i>singer</i> . As these two sounds are rarely employed in the same locality, no attempt is made to distinguish between them.	
p	As in English.	
ph	As in <i>loophole</i> - - - -	Mokpho, Chemulpho.
th	Stands both for its sound in <i>thing</i> , and as in <i>this</i> . The former is most common -	Bethlehem.

Letters.	Pronunciation and Remarks.	Examples.
q	should never be employed; the sound of <i>qu</i> in <i>quiver</i> is given as <i>kw</i> . When <i>qu</i> has the sound of <i>k</i> , as in <i>quoit</i> , it should be given by <i>k</i> .	Kwangtung.
r	As in English.	
s	As in <i>sin</i> .	
sh	} As in English.	
t		
v		
w		
x		Sawákin.
y	is always a consonant, as in <i>yard</i> , and therefore should never be used as a terminal, <i>i</i> or <i>e</i> being substituted. Thus, not <i>Mikindány</i> or <i>Wady</i> , but not <i>Kwaly</i> , but	Kikūyu. Mikindáni, Wadi. Kwale.
z	English <i>z</i> - - - - -	Zulu.
zh	French <i>j</i> , or as <i>s</i> in <i>treasure</i> - - - - -	Muzhdaha.
	Accents should not generally be used, but where there is a very decided emphatic syllable or stress which affects the sound of the word, it should be marked by an acute accent.	Tongatābu, Galāpagos, Palāwan, Sarāwak.

In the transliteration of Malay or other native names from Dutch charts where they are spelt according to Dutch orthography—

Dj has been rendered by J,
Tj " " " Ch,
oe }
oo } " " " U,
ou }
ee " " " E.

J in the middle of a word if followed by oe has been rendered by Y, though not always. Ij has been rendered by ai generally.

Thus the island east of Java, in possession of the Dutch, is spelt Madoera by them, but on Admiralty charts Madura. A town in Java appears on Dutch charts as Tjilatjap; in the British, Chilachap.

INFORMATION RELATING TO CHARTS, SAILING DIRECTIONS, AND THE GENERAL NAVIGATION OF H.M. SHIPS.

ON THE CORRECTION OF CHARTS, LIGHT LISTS, AND SAILING DIRECTIONS.

THERE are three descriptions of publications as guides to navigation—the Charts, the Sailing Directions, and the Light Lists—which are all affected by the continual changes and alterations that take place.

Of these the charts should always be, so far as our knowledge permits, absolutely correct to date; and the light lists should be noted for the recent alterations, though space will not permit of full details being always inserted. The sailing directions, however, cannot, from their nature, be so corrected, and, *in all cases where they differ from charts, the charts must be taken as the guide.*

1. *Charts.*—When issued to a ship on commissioning, the charts have received all necessary corrections to date. As sent from the Hydrographic Office they are, as a rule, fresh from the plates. They then receive such corrections by hand in the dépôts as are required, and are so issued to the ships.

The Charts in the folios should have the same dates of correction as shown against each in the Lists pasted on the outside of the folio. The Navigating Officer is to satisfy himself that they do so agree before signing the receipt for the same.

All small, but important corrections, that can be made by hand, are notified by Notices to Mariners, and should at once be placed on the charts to which they refer.

Large corrections, that cannot be conveniently thus made, are put upon the plates, and fresh copies are issued to the ships to replace the others, which are directed to be destroyed to prevent the possibility of their being used in the navigation of the ship.

The dates on which these large corrections are made are noted on the chart plates in the middle of the lower edge; those of the smaller corrections at the left-hand lower corners.

In all cases of quotations of charts, these dates of corrections should be given as well as the number of the chart (which will be found in the

lower right-hand corner), in order that at the Admiralty it may be known what edition of the chart is referred to.

For convenience of office reference each chart has now two numbers, the ordinary number in the right-hand lower corner, and a number in brackets, thus : [429] in the left-hand lower corner, which is now called the New Number.

These new numbers are also given in the Catalogue of Admiralty Charts.

2. *The Light Lists*, annually published at the beginning of each year, are not corrected in the depôts before issue, but appendices are issued every two months, giving the alterations that have taken place, copies of which are put into the chart boxes.

It is the duty of the navigating officer, when he receives the set of charts, to make notations in the Light Lists from these appendices, and from the Notices to Mariners in the box ; and to keep them so corrected from time to time.

The Light Lists should always be consulted as to the details of a light, as the description in the Sailing Directions may be obsolete, in consequence of changes made since publication. The charts also may not be equally up to date in some details, for which no Notices to Mariners have been issued.

3. *The Sailing Directions* are not corrected before issue, except occasionally for very important new rocks or dangers. Hydrographic Notices and Supplements referring to each volume are published from time to time.

Supplements contain all the information received up to date, since the publication of the volume to which they refer, and cancel all previous Hydrographic Notices.

Hydrographic Notices contain all information up to date, since the publication of the volume, or since the last Supplement or Hydrographic Notice, but endeavour is made to issue no more than one of these affecting each volume, and, on the collection of fresh information, to include the former Notice in a Supplement.

The existence of Supplement or Hydrographic Notices is to be noted in the tabulated form placed for the purpose inside the cover of each volume, in cases when such notations have not been made before issue, and also on receipt of further Notices after commission.

Notes should be made in the margin of the volume of sailing directions affected, as references to the Supplements or Hydrographic Notices when the latter are printed on both sides.

To enable the books to be more conveniently corrected, however, such Supplements and Hydrographic Notices, as are of moderate size, are now being printed on one side only, and two copies are issued to each ship; one to cut up, the slips being pasted in at the appropriate place; the other to retain intact for reference.

To make these notations, or paste in these slips, is one of the early duties of a navigating officer after drawing his box of charts and books, and similar notes are to be made from Notices to Mariners that may thereafter be received.

It must, however, be thoroughly understood that sailing directions will never be correct in all details, except up to the date of the last Hydrographic Notice or Supplement, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide; for which purpose, for ordinary navigation, they are sufficient.

THE USE OF CHARTS AS NAVIGATIONAL AIDS, AND GENERAL REMARKS RELATING TO PRACTICAL NAVIGATION.

1. *Accuracy of a Chart.*—The value of a chart must manifestly depend upon the accuracy of the survey on which it is based, and this becomes more important the larger is the scale of the chart.

To estimate this, the date of the survey, which is always given in the title, is a good guide. Besides the changes that, in waters where sand or mud prevails, may have taken place since the date of the survey, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail, and, until a plan founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbours and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fulness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

It appears to be insufficiently realized that the degree of reliance which may reasonably be placed upon an Admiralty chart, even in surveys of modern date, is mainly dependent on the scale on which the survey was made. The scale for publication is now generally that of the original survey, except in the case of Coast sheets, which are sometimes reduced. It should not, therefore, be assumed that the original survey was made on a larger scale than that published.

It must be borne in mind that the only method of ascertaining the inequality of the bottom of the sea is by the laborious process of sounding, and that in sounding over any area, the boat, or vessel, obtaining the soundings, is kept on given lines; that each time the lead descends it only ascertains the depth of water over an area equal to the diameter of the lead, that is about two inches, and that consequently each line of soundings, though miles in length, is only to be considered as representing a width of two inches.

Surveys are not made on equal scales, but each survey is made on a scale commensurate with its apparent importance. For instance, a general survey of a coast which vessels only pass in proceeding from one place to another is not usually made on a scale larger than one inch to the nautical mile, whilst surveys of areas where vessels are likely to anchor, are made on a scale of three inches to the mile, and surveys of frequented ports, or harbours likely to be used by Fleets, on a scale of from six inches to ten inches to the nautical mile.

Close examination by sounding is the only method by which surveys on a large scale can be made, and in view of the vast mileage of surveys yet requiring completion in the interests of navigation, it would be a waste of time to undertake large Coast surveys.

The scale on which a survey is to be conducted having been settled, it is manifestly superfluous to obtain more lines of soundings than can be represented on the paper. 100 soundings, which is the maximum number that can be placed with clearness on every square inch of paper, means that on a scale of one inch to the mile each sounding on the chart occupies an area representing eight acres of actual ground, whilst on a scale of six inches to the mile each sounding represents an area of a little less than a quarter of an acre, *i.e.*, of 100 feet square.

The following diagram represents as many soundings as can be placed legibly on a square inch of paper.

16	15	15	13	14	12	11	10	9
14	15	14	14	15	12	11	9	8
15	15	14	17	16	14	13	10	9
16	16	17	16	15	12	11	8	9
16	17	15	12	9	7	7	7	9
16	17	15	12	9	5	4	5	6
19	16	12	7	5	4	5	6	8
22	19	16	10	5	5	6	7	8
20	16	12	7	5	6	6	7	8
18	15	11	9	7	7	7	8	10
25	17	14	11	12	10	9	10	11

Little assistance in detecting excrescences on the bottom is afforded by the eye, even in clear water, on account of the observer being within five feet of the surface, none in turbid seas. If there is no inequality in the soundings to cause suspicion, a patch between two lines may occasionally escape detection.

Lines of soundings plotted as close as may be practicable on a scale of 6 inches to the mile would be 100 feet apart, and each line would be only 2 inches in actual width.

Thus, in a chart on a scale of 1 inch to the mile, an inequality of some acres in extent rising close to the surface, if it happened to be situated between two lines, might escape the lead; whilst in a chart on a scale of 6 inches, inequalities as large as battleships, if lying parallel to, and between the lines of soundings, might exist without detection if they rose abruptly from an otherwise even bottom.

General Coast charts should not, therefore, be looked upon as infallible, and a rocky shore should on no account be approached within the contour line of 10 fathoms, without taking every precaution to avoid a possible danger; and even with surveys of harbours on a scale of 6 inches to the mile, vessels should avoid, if possible, passing over charted inequalities in the ground, as some isolated rocks are so sharp that the lead will not rest on them.

Blank spaces among soundings mean that no soundings have been obtained in these spots. When the surrounding soundings are deep it may with fairness be assumed that in the blanks the water is also deep; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch.

A wide berth should therefore be given to every rocky shore or patch, **and this rule should be invariably followed, viz., that instead of considering a coast to be clear unless it is shown to be foul, the contrary should be assumed.**

2. Fathom Lines a Caution.—Except in plans of harbours that have been surveyed in detail, the five-fathom line on most Admiralty charts is to be considered as a caution or danger line against unnecessarily approaching the shore or bank within that line, on account of the possibility of the existence of undiscovered inequalities of the bottom, which nothing but an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for such a detailed survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

The ten-fathom line is, on rocky shores, as before mentioned, another warning, especially for ships of heavy draught.

Charts where no fathom lines are marked must be especially regarded with caution, as it generally means that soundings were too scanty and the bottom too uneven to enable them to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed round, as there is no knowing how closely the spot may have been examined.

3. Chart on Largest Scale always to be used.—It sometimes happens that, from press of work, only the copper plate of the larger scale chart of a particular locality can at once receive any extensive re-arrangement of coast-line or soundings. This is an additional reason, besides the obvious one of the greater detail shown, why this largest scale chart should always be used for navigating.

4. Caution in using small Scale Charts.—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. This is particularly to be observed when coming to an anchor on a narrow ledge of convenient depth at some distance from the shore.

For the same reason bearings to objects near should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in displacing the position the longer the line to be drawn.

5. Distortion of Printed Charts.—The paper on which charts are printed has to be damped. On drying, distortion takes place, from the inequalities in the paper, which greatly varies with different paper and the amount of the original damping; but it does not affect navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree, when carefully plotted upon the chart, especially if the lines to objects be long. The larger the chart the greater the amount of this distortion.

6. Buoys.—It is manifestly impossible that any reliance can be placed on buoys always maintaining their exact position. Buoys should therefore be regarded as warnings and not as infallible navigating marks, especially when in exposed positions; and a ship should always, when possible, be navigated by bearings or angles of fixed objects on shore and not by buoys.

Gas Buoys.—The lights shown by gas buoys cannot be implicitly relied on, as, if occulting, the apparatus may get out of order, or the light may be altogether extinguished.

7. Lights.—Circles drawn on charts round a light are not intended to give information as to the distance at which it can be seen, but solely indicate, in the case of lights which do not show equally in all directions, the bearings between which the variation, or visibility, or obscuration of the light occurs.

All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of an observer's eye of 15 feet. The table of distances visible due to height, at the end of each Light List, affords a means of ascertaining how much more or less the light is visible should the height of the bridge be more or less. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light at night, the fact is often forgotten that from aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be afterwards obtained from the standard compass.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by remarking its order, as given in the Light Lists, and in some cases by noting how much its visibility in clear weather falls short of the range due to the height at which it is placed. Thus, a light standing 200 feet above the sea, and only recorded as visible at 10 miles in clear weather, is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles, if of any power. (See table in Light List before mentioned.)

The distance from a light cannot be estimated either by its brilliancy or its dimness.

8. Fog Signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from wind, large areas of silence have been found in different directions and at different distances from the fog signal station in some instances even when in close proximity to it. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly towards the land, and is not observed by the people at a station until it is upon them; whereas a ship may have been for many hours in it, and approaching the land. In such a case no signal may be made. When sound has to travel against the wind, it may be thrown upwards; in such a case, a man aloft might hear it when it is inaudible on deck. Under certain conditions of the atmosphere, when a fog signal is a combination of high and low notes, one of the notes may be inaudible.

The mariner should not assume—

- a. That he is out of hearing distance, because he fails to hear the sound.
- b. That because he hears a fog signal faintly, that he is at a great distance from it.
- c. That he is near it, because he hears the sound plainly.
- d. That the distance from and the intensity of the sound on any one occasion, is a guide to him for any future occasion.
- e. That the fog signal has ceased sounding, because he does not hear it even when in close proximity.

Taken together, these facts should induce the utmost caution in closing the land in fogs. The lead is generally the only safe guide.

9. Tides and Tidal Streams.—In navigating coasts where the tidal range is considerable, caution is always necessary. It should be remembered that there are indraughts to all bays and bights, although the general run of the stream may be parallel to the shore.

The turn of the tidal stream off shore is seldom coincident with the time of high and low water on the shore. In open channels, the tidal stream ordinarily overruns the turn of the vertical movement of the tide by about three hours, forming what is usually known as tide and half-tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

In crossing a bar or shallow flats, the table (B) at page 146 of the Tide Tables will be found of great assistance in calculating how much the water has risen or fallen at any hour of the tide.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can never be depended upon, and additional caution is necessary.

It should also be remembered that at times the tide falls below the level of low water ordinary springs. This always occurs on the coasts of Europe at the equinoxes, but in other parts of the world, and especially in the Tropics, such periodic low tides may coincide more frequently with the solstices. Wind or a high barometer may produce it at any time, and the amount varies with locality. When the moon's perigee coincides with the full or new moon the same effect is often produced.

10. Arrows on charts only show the most usual or the mean direction of a tidal stream or current. It must never be assumed that the direction of a stream will not vary from that indicated by the arrow. In the same manner, the rate of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

11. Fixing Position.—The most accurate method of fixing a position relative to the shore is by angles between well-defined objects on the chart. All ships are now being supplied with a station-pointer, and this method should be used whenever possible.

Two things are, however, necessary to its successful employment. First, that the objects be well chosen; and, second, that the observer is skilful and rapid in his use of the sextant.

For the former, reference can be had to the pamphlet on the use of the station-pointer, which is in every chart box; the latter is only to be obtained by practice.

It will readily be seen that in war time, when the compass may be knocked away, or rifle fire may make it undesirable to expose the person more than necessary, a sextant offers great advantages, as angles can be obtained from any position whence the objects are visible. It is this contingency that makes it especially desirable that all navigating officers should become expert in this method of fixing a ship's position.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbours or narrow passages among mud banks, navigation by sextant and station-pointer is invaluable, as a true position can only be obtained by its means. A small error in either taking or plotting a bearing under such circumstances may put the ship ashore.

It is not intended that the use of the compass to fix the ship should be given up; there are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed. In all cases where great accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal, or of additions to a chart, as fresh soundings or new buildings. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. In the case of ordinary soundings, it is only necessary to take a third angle now and then; firstly, to check the general accuracy of the chart as above stated; secondly, to make certain that the more important soundings, as at the end of a line, are correctly placed.

Sometimes, when only two objects are visible, a compass bearing and sextant angle may be used with advantage.

In passing near a point of land, or an island, the method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "four-point bearing," when the bearing is taken four points on the bow, and on the beam, the distance from the object at the latter position being the distance run between the times of taking the two

bearings, allowing for current, gives an excellent fix for a departure, but does not ensure safety, as the point, and probably the rocks off it, are abeam before the position is obtained.

By taking the bearings of two points and four points on the bow, a very good position is obtained before the object is passed; the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current.

A table of factors, by which to multiply the distance run, to obtain the distance of the object when any number of degrees between the two bearings has been observed, is now supplied in all chart boxes.

The use of a danger angle in passing outlying rocks with land behind should also not be forgotten. In employing this method, however, caution is necessary, as, should the chart be not accurate, *i.e.*, should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

In fixing by the compass, it must always be remembered that two bearings only are liable to error. An absolute error may be made in either bearing observed; errors may be made in applying the deviation; or errors may creep in in laying them on to the chart. For these reasons, a third or check bearing of some other object should be taken, especially when near the shore or dangers. The coincidence of these three lines will prevent any mistakes.

Amongst astronomical methods of fixing a ship's position, attention is drawn to the great utility of Sumner's method. A Sumner line, that is, a line drawn through the position (obtained by an assumed latitude and longitude by chronometer) at right angles to the bearing of the sun, as obtained from the azimuth tables, gives at times invaluable information, as the ship must be somewhere on that line provided the chronometer is correct. A deep cast of the lead at the same time may often serve to get an approximate position on the line. An early and very accurate position can be also obtained by Sumner's method, by getting a longitude by a bright star at daylight when the horizon is well visible, and another longitude by the sun when a few degrees above the horizon, or by observing two or more stars at twilight. The Sumner lines drawn through the two positions thus obtained will, if the bearing of sun and star differ three points or more, give an excellent result.

12. *Change of Variation of the Compass.*—The gradual change in the variation must not be forgotten in laying down positions by bearing on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long, the displacement of position from neglect of this change may be of importance. The compasses

are re-engraved when the error amounts to a quarter of a point, but the chart plates cannot be corrected more frequently from the impossibility of making alterations too often on one spot in a copper plate.

The geographical change in the variation is in some parts of the world sufficiently rapid to need consideration. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles. The variation chart should be consulted on this head.

13. Local Magnetic Disturbance of the Compass on board Ship.—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the ship in which it is placed. Observation shows that disturbance of the compass in a ship afloat is experienced only in a few places on the globe.

Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such rapid proportion as the distance from it increases that it would require a local centre of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow, and the force strong, the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centres near together.

It is very desirable that whenever a ship passes over an area of local magnetic disturbance, the position should be fixed, and the facts reported as far as they can be ascertained.

14. Use of Oil for Modifying the Effect of Breaking Waves.—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skilfully applied, may prevent much damage both to ships (especially the smaller classes) and to boats, by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows :—

1. On free waves, *i.e.*, waves in deep water, the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain; as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.
3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when nothing else is obtainable; but all animal and vegetable oils, such as waste oil from the engines, have great effect.

4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

5. It is useful in a ship or boat, both when running, or lying to, or in wearing.

6. No experiences are related of its use when hoisting a boat up in a sea-way at sea, but it is highly probable that much time and injury to the boat would be saved by its application on such occasions.

7. In cold water, the oil, being thickened by the lower temperature, and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

8. The best method of application in a ship at sea appears to be : hanging over the side, in such a manner as to be in the water, small canvas bags, capable of holding from one to two gallons of oil, such bags being pricked with a sail needle to facilitate leakage of the oil.

The position of these bags should vary with the circumstances. Running before the wind they should be hung on either bow—*e.g.*, from the cathead—and allowed to tow in the water.

With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

Lying to, the weather bow and another position farther aft seem the best places from which to hang the bags, with a sufficient length of line to permit them to draw to windward, while the ship drifts.

9. Crossing a bar with a flood tide, oil poured overboard and allowed to float in ahead of the boat which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances the effect cannot be so much trusted.

On a bar with the ebb tide it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current, and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil is diffused well ahead of the boat, and the bag can be readily hauled on board for refilling if necessary.

IN THIS WORK THE BEARINGS ARE ALL MAGNETIC,
EXCEPT WHERE MARKED AS TRUE.

THE BEARINGS OF THE LIGHTS ARE FROM SEAWARD.

THE DISTANCES ARE EXPRESSED IN SEA MILES OF
60 TO A DEGREE OF LATITUDE.

A CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO
100 FATHOMS, OR THE TENTH PART OF A MILE.

THE SOUNDINGS ARE REDUCED TO LOW WATER OF
ORDINARY SPRING TIDES.

INDEX TO

A number against a place thus: Misford Fr 1220

The portions embraced by the pecked line thus, are those described in this volume.

See also *Thina* *Sea chart* 1263

more

The charts and plans shown on this Index represent those published at the date given at the foot. They are liable to alteration and amendment.

PACIFIC OCEAN



Longitude East from Greenwich

Engineered by Davies & Company

March 1906

W. O. Easton Archipelago-Part I.

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EASTERN ARCHIPELAGO.—PART I.

(EASTERN PART)

CHAPTER I.

GENERAL REMARKS.—WINDS AND WEATHER.—CURRENTS
AND TIDES.—COMMUNICATION.—PASSAGES.

GENERAL REMARKS.—This volume contains a description of the Eastern portion of the Eastern archipelago, namely, the islands that border the steam route usually followed from the China sea through the Sulu and Celebes seas, Molucca passage, Banda and Arafura seas towards Australia; and includes a description of the Philippine islands, the Sulu archipelago, the N.E. extremities of Borneo and Celebes, Gillolo, Ceram and Buru islands, the Arafura sea, and the western coast of New Guinea.

The work commences with the north part of Luzon island, where it overlaps the China Sea Directory, Vol. II., and consequently the description given of the west coasts of Luzon and Mindoro, and of Mindoro strait should be compared with the description given in China Sea Directory, Vol. II., and then corrected if necessary, *i.e.*, if the China Directory is of a later date than this volume.

The southern limit of the work embraces the Arafura sea, and a description of port Darwin and the approaches to it, comprising part of the North Australian coast included between De Courcy head to the east, and Adam bay to the west. In this it overlaps the Australia Directory, Vol. III., and consequently should be compared with that work if it is of a later date than this book.

Want of Surveys.—The greater part of the coasts and waters of the Eastern archipelago have as yet been very imperfectly surveyed. Even in the larger scale charts, founded on more recent examinations, omissions must be expected, as the irregular character of the depths and the prevalence of coral formations forbid any certainty that all dangers have been discovered.

PHILIPPINE ISLANDS.—The northern end of the East Indian archipelago is formed by the Philippine group of islands, the principal of which are Luzon at the north extreme, and Mindanao at the

southern end ; between these there are several smaller islands, the most important of which are Mindoro, Paláwan, Panay, Negros, Sebu, Leite, and Samar.

The existence of the Philippines, a rich and beautiful group of islands, was first made known to Europeans by the Portuguese navigator Fernando de Magalhaens early in the sixteenth century. The islands are considered by the Philippine Commission to be 1,725 in number, and to contain an area of about 119,500 square miles, with a population estimated for the present time at about 8,000,000.

These islands were formally annexed to Spain in 1565 ; but were ceded to the United States of America by treaty dated 10th December 1898.

The people of the islands consist principally of the aboriginal Abetas or Etas, of dark brown colour, with woolly hair and regular features, living as independent tribes in the interior ; and those of Malay origin, known as Tagalas and Bisayas, occupying the maritime districts. Most of the islands are clothed with forests of ebony, iron-wood, cedar and sappan wood. They are generally mountainous and have many volcanic cones ; that of Albay in the southern part of Luzon is 8,274 feet in height, and constantly emits smoke and steam.

Earthquakes of the most severe description have been experienced, the earliest recorded took place in 1616 ; that of 1796 was sadly calamitous. In 1824 many churches in Manila were destroyed, together with the principal bridge and numbers of houses, and a chasm opened four miles in length. In 1828, 1832, 1852, 1863, 1869, and 1880 there were terrible shocks of earthquake, and in 1891, in the province of Panga Sinan, earthquakes were continually repeated during a period lasting a month. The most recent was the destructive eruption of Mayon in 1897.

The **capital** of the Philippines and the seat of Government is Manila, on the west side of Luzon ; its bay affords anchorage for all classes of vessels, but owing to its great size the shelter is not good, and typhoons at times cause great damage to the shipping.

Products.—The chief products are sugar, hemp, tobacco, and coffee ; the foreign trade is confined to the ports of Manila, Iloilo, Sebu, and Samboanga. For exports from Manila, *see* page 65.

Climate.—The climate of the Philippines varies little from that of other places in the same latitude. The range of the thermometer during the year is from a little over 60° to about 90° Fahrenheit. The year may be divided into three seasons : the first, cold and dry, commences in November ; the second, warm but still dry, commences in March, the greatest heat being experienced from April to the end of May ; and the third, which is exceedingly wet, continues from June to the middle of November. During the rainy seasons inundations are frequent, and travelling in the interior

almost impossible. The principal parts of the group come within the range of typhoons, and terrific storms are of frequent occurrence; the local storms that come in the months of May and June, the period of greatest heat, are at times very severe. A typhoon which occurred on 20th October 1882 left thousands without shelter, and great loss of life and property resulted. *See also* page 18, and weather table, page 572.

The endemic complaints of the country are swamp fever, diarrhœa, beri-beri, and a few others; the mortality is low considering the number of inhabitants.

Railways. — Telegraphs. — There is railway communication between Manila and Dagupan, a distance of 123 miles, and the principal places in Luzon are connected by land telegraph. Manila is connected with Hong Kong, and with Negros, Sebu, Leite, Mindanao, Sulu, and all the principal islands, by submarine cables.

Communication. — *See* pages 29 and 66.

Navigation. — In navigating the waters of the Philippines during the rainy season a sharp look-out must be kept for flotsam. Trees of immense size will be frequently met afloat. They have been found especially numerous on the south coast of Luzon; in one case, near Marinduque island, a group of them was adrift, still upright and resembling an island.

THE SULU ARCHIPELAGO is a chain of islands, more than 150 in number, with an area of about 1,000 square miles, extending between the south-west extremity of Mindanao and the north-east extremity of Borneo; it is divided into three groups, taking their names from the principal islands in each.

These islands were ceded by Spain to the United States of America 10th December 1898, but so far have been really in the hands of native Malay or Arab chiefs, the influence of the Spaniards having been confined to the coast ports. The Sultan of Sulu, who formerly claimed dominion over most of the islands, has no power beyond the immediate vicinity of the town of Sulu.

The inhabitants are Mohammedans, of Malay race, speaking a peculiar language, which they write in the Arabic character. They are considerably advanced in civilisation, and are engaged in cultivating rice and rearing horses, cattle and poultry. The pirates of the archipelago were once a terrible scourge to the eastern seas, and are still a terror to native vessels and to many unprotected coasts.

The principal articles of commerce furnished by the islands are tortoise shell, trepang, and edible birds' nests, besides pearl and pearl shell. A steamer from Manila makes the round of the islands twice a month, and there is occasional steam communication between Sulu and Borneo.

BORNEO, the largest island in the East Indian archipelago, is about 690 miles in length north and south, its greatest breadth being 600 miles, and its average width about 350 miles. Chains of mountains traverse its length; the main range from 5,000 to 6,000 feet in height, terminates in Kini Balu, a mountain 13,700 feet in height, situated about 50 miles from the north extreme of the island. There are several other ranges of mountains.

Its vast interior consists of almost impenetrable virgin forests teeming with animal life, but sparsely populated by man. The soil is fertile, and in some parts near the coast is marshy.

The Dutch claim sovereignty over the greater part of the south and west parts of the island, along the coast of which they maintain establishments. The territories of the Rajah of Saráwak, the Sultan of Bruni, and of the British North Borneo Company, extend over and along the north-west, north, and north-eastern coasts. The native states are insignificant and in a backward condition.

The total population is estimated at nearly 2,000,000. The productions are many and varied, and its mineral resources are believed to be great. The Chinese, who have been settled in most Bornean towns for generations, conduct all the trading operations. The natives are of the Malayan type, and are, as a rule, indolent and wanting in enterprise.

A British Protectorate exists over Saráwak, Bruni, and the British North Borneo Company.

BRITISH NORTH BORNEO.—This territory, formerly known as Sabah, situated at the north-eastern end of Borneo, has a coast line of about 500 miles. The chief geographical feature in the territory is the Kini Balu mountain. The territory of British North Borneo was acquired from the Sultans of Bruni and Sulu by cession for a small annual payment in 1879–80, and the British North Borneo Company was incorporated by Royal Charter in 1881. The area of the territory is 31,000 square miles, and the population, according to a census taken in 1890, was about 120,000, which includes about 10,000 Chinese.

Harbours.—The best harbours are those of Gaya on the west coast, Kudat on the north coast, and Sandakan on the east coast; the rivers are small.

Produce.—Trade.—The principal products are tobacco, timber, rattans, gutta-percha, india-rubber, seed-pearls, birds' nests, trepang, beeswax, and other natural products. Tobacco planting promises to become a great industry; coffee is being taken up, and Manila hemp and sugar are receiving attention. The exports in 1899 amounted in value to \$3,439,560, and the imports to \$2,456,999 (exclusive of Labúan).

Climate.—The climate of North Borneo is noticeable for nothing more than for its equability, and the absence of extremes. The temperature, rainfall, winds, and diseases are, for a tropical country, of the most mild and temperate types, and compare not unfavourably with the Straits Settlements. The chief diseases are fever, beri-beri, and dysentery; fever forms about one-fourth of the cases treated in the hospital.

Communication.—Trading steamers run constantly between Sandakan, Labúan, and Singapore; and also to Hong Kong, and to Sulu. Sandakan is connected with Mempakol and Labúan by land telegraph; thence with Europe by submarine cables.

TALAUER and SANGIR GROUPS are two groups of islands between Mindanao and Celebes. The Sangir group is entirely volcanic, and seems to be a continuation of the volcanic belt of North Celebes. Both groups are governed by their own Rajahs, under the Dutch Residency of Manado, and carry on a trade in cocoanuts and oil with Manado and Ternate.

CELEBES ISLAND (Dutch) is the third in magnitude of the Malay archipelago. Its physical aspect as regards its form is most peculiar and fantastic, consisting of an irregular central body, from which radiate four long and narrow arms, forming three deep gulfs on the east side, while the west side has a curved and fairly regular coast-line.

The northern peninsula, which is the only part of the island treated in this work, is a long and narrow curved strip of land extending over 6° of longitude, reckoning from Palos bay to its extremity; in some places it is only 10 miles in breadth, and nowhere does it exceed 40 miles. A range of mountains runs through it, the general height of which does not exceed 2,000 feet, though some peaks rise to 4,000, 5,000, and even 6,700 feet; the whole of the peninsula is rugged and mountainous. The north-eastern extremity of this peninsula constitutes the fertile and highly cultivated district of Minahasa, the capital of which is Manado. A considerable portion of Minahasa is a plateau from 2,500 to 3,000 feet above the sea, with mountains rising to 6,000 feet or more; this plateau is exceedingly fertile, producing abundant crops of rice, coffee, and oranges.

MOLUCCAS.—(Dutch). The term Moluccas, though originally applied only to the five small islands of Ternate, Tidor, Motir, Makian, and Bachian, which lie off the western coast of the large island of Gillolo (Halmahera), now includes all the islands lying between Celebes on the west, Timor on the south, and New Guinea on the east. The Moluccas may be divided into three groups—the *Northern* consisting of Gillolo, with a number of islands closely adjoining it, and extending as far south as the Oúi islands; the *Central group*, separated from the former by the Ceram sea, comprising the large islands of Ceram and Buru, together with

Amboina and many smaller ones off the south-west coast of Ceram; and finally, the *Southern group*, which includes Banda, and the chain of islands lying between it and the Timor sea, and which may be said to form a continuous belt extending from Timor to the Aru islands, and from these latter to the south-east coast of Ceram.

The Molucca islands are generally rugged and mountainous. They have an area of about 44,000 square miles, with a population estimated to be approximately 400,000. The government of the northern group is administered by the Resident of Ternate; of the central group by the Resident of Amboina; and the remainder by the Assistant-Resident of Banda.

Northern group.—Gillolo and Ternate have active volcanoes; that of Ternate has been in a constant state of activity for more than 200 years, during which period there have been no less than 14 eruptions, the last of which occurred in 1840, and was attended by great loss of property. Obi is uninhabited and but little known.

The trade consists of coffee, cocoanuts, tobacco, pepper, and dammar gum. The steamers of the Netherlands India Company touch at these islands once a month.

Ceram, or Central group.—The principal islands are Ceram, Buru (Bouru), and Ambonia. Ceram is the largest of the Moluccas, though far from being of value proportionate to its extent. The island is little more than one mountain range, some of its peaks rising to the height of 6,000 and 8,000 feet above the sea, and the highest, Nusa Keli, to as much as 9,250 feet. The entire island is covered with a dense, unbroken forest, many of the trees being of stupendous growth. The eastern coast is bold and precipitous, and difficult of access; on the northern and southern coasts there are several deep and spacious bays, but no really good harbour. There is no regular steam communication with Ceram.

Buru.—With the exception of the broad bay of Kayeli, Buru is a compact unbroken mass of land of an oval form, apparently of sedimentary formation. The interior is a congeries of hill and mountain, divided by narrow valleys or deep ravines; the coast is alluvial and marshy. The soil is comparatively poor and sterile, and, beyond cajuput oil, there are no natural or vegetable products. Kayeli bay affords excellent and well-sheltered anchorage in both monsoons, and is much frequented by coasting traders from Makassar and Singapore. There is a large export trade in fish and cajuput oil.

AMBOINA is the largest of a group of five islands lying about 10 miles distant from the south-west coast of Ceram. It contains but one volcano, which, though for several centuries in a state of eruption, has been quiescent since 1824. The whole island is hilly, but none of the

mountains rise to any considerable elevation; the principal rocks are granite and serpentine, with much coralline limestone. The valleys are rich, being filled with decomposed volcanic ashes, but a large part of the island is arid and rocky, and unsuited for general agriculture.

Products.—Amboina and the other islands of the group have been long celebrated for their clove plantations, first introduced in 1651, but this spice has been gradually going out of cultivation. The pepper plant and cinnamon grow wild; coffee, cotton, and indigo are cultivated. There is an abundance and great variety of fruit, including the true or seedless bread-fruit tree, found only at Amboina.

Trade.—Amboina is the chief port of trade for the whole of the central and southern islands of the Moluccas. The principal articles of export are cloves, nutmegs, mace, and rattan, with birds of paradise, tortoise and other shells, and beeswax in smaller quantities. In 1886 the value of exports (exclusive of Government) was 39,984*l.*, that of the imports 89,885*l.*

Vessels of the Netherlands India Steamship Company call at Amboina about twice a month.

BANDA or SOUTHERN GROUP.—In this group are the Banda isles, the Goram and Matabela groups, the Ké and Aru islands, and the Servatti islands.

Banda isles, celebrated for their nutmeg plantations, consist of ten small islands all closely adjoining, situated about 60 miles from the south-east point of Ceram, and about 120 miles to the south-east of Amboina. The largest island is Banda Lontar, on which are most of the nutmeg trees; next to it in point of size is Banda Neira, which contains the principal Dutch settlement. The Banda islands are of volcanic formation, Gunong Api, an active volcano, being only the centre of what was once an enormous crater, of which Lontar, Neira, and the connecting islets form the rim, whilst those lying at a greater distance were gradually raised by the frequent discharges of volcanic matter. With the exception of the bare and ever smoking cone of Gunong Api, which rises to a height of 2,500 feet, the islands are of moderate elevation, the hills, which seldom exceed 1,000 feet, being clothed with a rich and luxuriant verdure. The whole group is subject to frequent earthquakes, and has more than once been almost overwhelmed by eruptions from Gunong Api, which, however, has been quiescent since 1852.

Products.—Almost the entire surface is planted with nutmeg trees, which grow under the shade of lofty kanari trees, and flourish with but little attention. Cloves and a variety of fruit are amongst the natural products; coffee has been cultivated in recent years with success in some of the islands. There is a considerable trade in oil (extracted from the

nuts of the kanari tree), birds-of-Paradise skins, pearl, tortoise-shells, and other products of eastern islands. In 1885 the total number of nutmeg estates was 34, the number of workmen employed on them being 2,869; the yield of nutmegs was 843 tons, of mace 150 tons, the value of which was about 90,000*l*.

The vessels of the Netherlands India Steamship Company touch here once a month.

Ceram Laut islands are a cluster of small islets lying about 6 miles off the south-east end of Ceram, of which the most important are Gisser and Kilwaru. Kilwaru islet is only a few feet above the level of the sea, but has nevertheless a large Bugis and Ceram population, and is greatly resorted to by traders from New Guinea, the Aru, Ké, and other islands, as well as by those from Celebes and Singapore. Trepanng and edible birds' nests are the principal articles of trade.

There is no Dutch settlement on Gorani and Matabela. The natives are governed by their own chiefs, and are principally engaged in making cocoanut oil and betel-nut paste.

KÉ ISLANDS consist of the large island of Great Ké, the two smaller ones Ké Dulan and Ruwab, and a number of islets which are situated about 180 miles south-east of the Banda isles and about 70 miles from the coast of New Guinea. These islands consist almost entirely of coralline limestone, and are covered with magnificent forests, which contain an abundance of fine timber trees, some of them said to be superior to the best Indian teak. Great Ké is mountainous, the land rising gradually from sandy beaches on either coast towards the centre, where a long ridge or back-bone, from 2,000 to 3,000 feet in height, extends through the island from north to south. The remaining islands are comparatively low and encircled by extensive shoals.

The inhabitants are for the most part true Papuans, a mixed race, being found only on the coast. They are famous boat-builders, and traverse the entire archipelago, as far west as Singapore, in all seasons and weathers; Eli and Dula are the chief centres of this industry. These islands are but little cultivated, and the only trade is in cocoanut oil.

The vessels of the Netherlands India Steamship Company call at Ké Dulan every other month.

ARU ISLANDS, about 70 miles east of the Ké islands, and 60 miles from the coast of New Guinea, consist of five principal islands and numerous smaller ones, extending 100 miles north and south, and 50 miles east and west. All the islands are of coralline limestone, the height nowhere exceeding 300 feet above the sea; and they are everywhere

clothed with virgin forest. The inhabitants are Papuans of various tribes, but generally inferior in physique to the Ké Papuans or the Mafors of Geelvink bay; the majority of them are in a state of utter barbarism.

The climate is very unhealthy, and during the trading season, January to July, cases of beri-beri are not uncommon. September and October are the only dry months.

Products.—Trade.—There are valuable fisheries off the east coast. The exports comprise mother-of-pearl, pearl oyster, tortoise-shell, trepang, birds of Paradise, and edible birds' nests, the annual value of which is about 18,000*l*. Fish, poultry, onions, and bananas are procurable.

Dobbo is the great commercial centre for the trade of the whole chain of islands lying between Timor and New Guinea, as well as for the south-west coasts of the latter island itself; it is visited during the trading season, which sets in with the north-west monsoon, by several thousands of Bugis, Ceramese, Chinese, and other traders.

The vessels of the Netherlands India Steamship Company touch here every other month.

SERWATTI ISLANDS.—Under this name are generally included the long chain of islands which extend from the east end of Timor towards the Aru islands, and which terminate in the Tenimber or Timor-laut group. These islands may be said to be divided into two nearly parallel chains, which approach each other off the coast of Timor. In the northern chain the principal islands are Wetta, Roma, Damma, Teon, Nila, and Serua; while those of the southern chain are Kissa, Letti, Moa, Lakor, Sermatan, and Babar.

The northern chain is, as a rule, rocky and mountainous, the hills being often bare of trees and the soil poor and sterile. All the islands are, however, pretty thickly inhabited, and many of the natives are Christians. The largest island is Wetta, with bleak, barren mountains on the northern coast from 2,900 to 3,900 feet in height. There is but little cultivated ground, and the natives are chiefly occupied in fishing. The southern chain of islands is of much lower elevation; the hills are generally well-wooded, and there are some extensive plains of good pasturage, as also a considerable amount of cultivation. Moa and Babar are the largest in this group. The cattle of Moa and Letti are of a superior breed to any in this part of the archipelago.

All these islands have a large and semi-Christianised population, who are much engaged in agricultural pursuits.

The islanders are divided into three classes, the *Marne*, or lords of the land, from whom the chiefs or rajahs are appointed by the Government; the *Boerstam*, who occupy an intermediate position, subordinate to the first-named; and the *Lascars*, or former slaves.

Nearly all these islands are visited by traders from Makassar, there being a considerable commerce in beeswax, pearl, tortoise-shell, and trepang.

The vessels of the Netherlands India Steamship Company touch every other month at Damma, Letti, and Kissa islands.

Tenimber or Timor-laut group.—This is an extensive group lying at the eastern extremity of the Serwatti islands, and distant only 190 miles from the north coast of Australia. The largest island of the group is Timor-laut or Yamdena, and separated from this island to the north and south of it are the islands Larat and Selaru. To the north and west of these three principal islands is a continuous chain of outlying islets, only two of which—Molu and Seira—are of any importance.

These islands are with few exceptions low, the coast, which is much indented and encircled by reefs, being covered with cocoanut palms and thickets of mangroves, and fringed by precipitous coral bluffs from 60 to 80 feet high, on which the villages are placed. The inhabitants, who were estimated to number about 25,000 in 1881, are a mixture of Malayan and Papuan races, and are industrious cultivators and fishermen; until within the last twenty years they have had scarcely any intercourse with Europeans. Fever is very prevalent. There are valuable fisheries off the coast.

Vessels of the Netherlands India Steamship Company call at Larat and Seira every other month.

NEW GUINEA.—History.—The earliest map of New Guinea was published in 1595 from information supplied by the Portuguese. Dom Jorge de Menezes wintered here, probably in the neighbourhood of Geelvink bay, in 1526, and hence may be considered the discoverer. In 1528, Saavedra sailed along the north coast, and called it *Isla de Oro*, but in 1545 this name was changed to New Guinea by Ortiz de Retes, one of the captains under the Spanish navigator Villalobos. Of the north coast of New Guinea the earliest information comes from the Dutch navigators Lemaire and Schouten, who, in 1616, discovered and traced a considerable portion of the coast westward of the present cape D'Urville; this part was also seen by Dampier in 1700.

In 1705 a Dutch expedition under Jacob Weyland discovered and mapped Geelvink bay. In 1794, Captain Forrest, of the East India Company's service, visited the north coast in a little vessel of ten tons, and 20 years later Captain McCluer arrived on the north-west coast to succour the survivors of an attempted settlement by Captain Hayes of the East India Company's ship *Batavia*.

The Dutch Government, first supported, and eventually assumed as suzerains, the claims of a Moluccan ruler, the Sultan of Tidore, who had long held supremacy over Papua, thereby meaning the extreme western

portion of New Guinea and some districts in the neighbourhood of Geelvink bay. They have therefore despatched several small exploring expeditions to these coasts, and their territory is now as described on page 12.

Extent and area.—The island of New Guinea forms as it were a connecting link between the Eastern archipelago and the Polynesian group, and the western portion of it only, falls within the limits of this work. The northern point of New Guinea lies 20 miles south of the equator, and the island extends through rather more than 10 degrees of latitude and 20 degrees of longitude, its length in an easterly and westerly direction being 1,306 miles, while its area, including that of the adjacent islands, is about 312,000 square miles.

Its contour is irregular, the central part being about 370 miles wide, whence it stretches westward in a long and gradually narrowing peninsula, forming at the head of Geelvink bay an isthmus little more than 20 miles in breadth; further west, the peninsula, which has again broadened out, is penetrated from the west by McCluer's inlet, leaving a neck of land only about 30 miles wide between it and the western side of Geelvink bay.

This vast island is generally mountainous on its northern coast, and also at the extreme west of the above peninsula; the south coast eastward of long. 135° E. is low and swampy, covered with gigantic trees, and bordered by a broad belt of mud banks which stretch seaward to a distance of 9 or 10 miles. Westward of the above meridian, the entire coast-line as far round as and including Geelvink bay is closely fringed by a succession of islands, many of them being of considerable size. The interior of the island is but little known, but it is covered with dense forests, as is also the greater part of the shores.

Inhabitants.—The inhabitants of New Guinea comprise distinct races, but above all is the well-marked Papuan type, of which this island is the centre, and it would appear that the most typical examples are to be found in the northern peninsulas; a lighter-coloured race is found in the south-eastern part of the island, and they are the more civilised of the two. They average about 5 feet 3 inches in height, and are of a light, active build, often with good features, which they paint, but are disfigured by the nose and ear ornaments and the constant use of betel-nut. Both sexes go almost naked, except in the neighbourhood of the mission stations, and in some inland districts that have not yet come under control they are cannibals. Their weapons are bows and arrows, wooden spears and swords, clubs, slings, and stone hatchets. Caution should be exercised in dealing with them.

The south coast natives are considerable traders, frequently making long voyages, and trading with sago, pottery, ornaments, &c. The trading canoes are huge and unwieldy, and are very bad sailers; they are composed

of three canoes lashed together, with bulwarks built on, and at each end is a covered place for sleeping in.

Sorcery and superstition are of so much importance with these natives that it should be taken into consideration in all dealings with them; and their ideas on these subjects are so foreign to those of white men, that it cannot be wondered if the latter sometimes unintentionally offend native prejudices, and consequently suffer from the results of their inexperience.

The houses are built, after the Malay fashion, on poles raised 5 or 6 feet from the ground. Their fishing nets are similar to an English seine.

Political divisions.—The island of New Guinea is divided between the British, Dutch, and Germans. In 1885, the portion of New Guinea lying to the eastward of the 141st meridian was divided between Great Britain and Germany; that to the westward belongs to Holland.

That part of the island with which this book deals lies entirely in Dutch territory.

Dutch territory.—The western portion of New Guinea, with the off-lying islands west of the meridian of long. 141° E., is Dutch territory. For the purpose of getting a definite boundary, the mouth of the Bensbach, a small river in about long. $141^{\circ} 2'$ E., has been accepted as the boundary between British and Dutch territory on the south coast of New Guinea, until this meridian meets the Fly river, when that river becomes the boundary until it cuts the meridian of 141° E., which meridian is the boundary on the north coast of New Guinea, a few miles westward of Germania point.

Dutch New Guinea, is said to have an area of about 151,800 square miles, and to contain a population of about 200,000; this latter number is, however, mere conjecture. The only Dutch settlement known to exist at present is that at Dorei bay, a small inlet on the western shore, and just within the entrance to Geelvink bay; it is believed to be a coaling station for the Government vessels cruising in these waters, but there are no particulars concerning it.

Trade.—The chief trade is in trepang and tortoise-shell, birds-of-Paradise skins, dammar, and *masoi* bark. Vessels of the Netherlands India Steamship Company call at Segaar bay and Fak Fak on the west coast once in two months. In 1889 there were reported to be seven mission stations in New Guinea. See also *Pacific Islands*, Vol. I., 3rd Edition, 1900.

WINDS and WEATHER.*—General remarks.—The south-west and north-east monsoons of the China sea also prevail over the Philippine islands, the Sulu sea, and the northern part of the Celebes sea, but they blow with diminishing force as lower latitudes are reached,

* See Admiralty Wind and Current Atlas for the Pacific, &c.

and, south of lat. 4° N. the winds are more variable, and often assimilate to those of the Molucca channel. Land and sea breezes occur near the coast.

In the China sea, the north-east monsoon is much the stronger, and the more permanent of the two, being but rarely interrupted; whilst the south-west is particularly irregular, and often very weak. The winds may be summed up briefly as follows:—From November to March the north-east monsoon blows. In April calms precede the change of the monsoon, with variable winds between N.E. and S.E.

In May the south-west monsoon is established on the Asiatic coast, with N.E. to S.E. winds in the middle of the sea, and easterly winds in the northern part.

In June, the south-west monsoon is fairly established. In September the monsoon becomes weak; strong winds from South to N.W. occur, often blowing with violence, and accompanied by rain on the coasts of Borneo and Paláwan.

In October the north-east monsoon is established, and blowing fresh in the northern part, except on the coast of Luzon, where it is feeble, with calms and showers from south-west, south of the parallel of 13° N.

In November and December the north-east monsoon is strong, but calms variable winds and rain occur, in the eastern portion.

For fuller particulars, and for an account of the winds and weather to be expected on the coast of Paláwan, see *China Sea Directory*, Vol. II.

South-west Coast of Luzon.—The winds on this coast are subject to some extent to the winds blowing in the China sea, namely, the north-east monsoon from mid-October to mid-May and the south-west monsoon from June to October. It may, however, be said that the north-east winds prevail on this coast, and they are generally fresh, especially in November, December and January, more particularly in the northern part. From February to May they have a tendency to haul eastward in abating. Gales from this quarter frequently set in which last from one to three days; they are nearly always indicated by bright weather with clouds to the north and a rise of the barometer. They also occur in rainy weather but with less force.

The north-east monsoon is regarded as the fine season, and the weather is generally dry and clear. The wind usually hauls to N.N.E. and north during the day, becoming calm during the evening and then the land breeze comes off. There are also sometimes intervals of calm, or westerly breezes blowing from about 10 a.m. until sunset.

The months of March and April are the finest on this coast; during May the winds are weak and variable; storms gather on the mountains and cause violent squalls from S.E. to S.W., occurring almost daily in Manila bay and the gulf of Lingayen.

The south-west monsoon is only well characterised from July to October, which is the period of the gales, termed "*Collas*," which blow from S.W. to West, and are accompanied by violent squalls and much rain. They often continue for several days. North-west gales and breezes from that direction are not frequent, but when the north-west wind sets in with a little rain and the land appears at intervals, a typhoon must be apprehended. The season of the storms is from September to November; the barometer often remains high and therefore does not always indicate their approach.

Sulu sea.—In the Sulu sea the east or north-east monsoon is not a steady fresh breeze, but is often variable. Near Mindanao the northerly winds never blow fresh, and light changeable winds often displace them for several days. The south-west monsoon commences in May, and becomes regular in June; during this monsoon the weather is gloomy and very wet. About the end of July or middle of August, and sometimes in October, the weather becomes bad, and severe storms (*collas*) occur, which are generally accompanied by thunder and lightning, and are not unlike typhoons. In September the wind decreases, the rain is less, and the sky becomes clear, but in the morning there is a thick fog which lasts till noon. At the change of the monsoon bad weather is felt at times, as in the China sea.

At the commencement of the westerly monsoon the winds are light for some time, with heavy rain, during which the wind blows from an opposite direction, lasting, from the eastward, sometimes for above a week. Occasionally heavy storms happen until the westerly winds become established. During the whole of this monsoon the weather is cloudy, rainy, and at times stormy.

North-east Coast of Borneo.—The characteristics of the weather in this region are:—but slightly developed monsoons, light winds, and heavy and perennial rainfall without well-marked wet and dry seasons. Northerly winds prevail; the south monsoon, which may be considered to take the place of the east monsoon in other regions, lasts three months only, viz., July, August, and September, and even then is not very steady. In October and November light winds and calms prevail; December to April, northerly winds from N.E. to N.N.W. are experienced, the monsoon being at its height in January. In May and June, calms and variable winds may be expected; calms are also prevalent in October and November.

Celebes sea.—In the Celebes sea there is but little westing in the wind, the prevailing direction of the monsoons being about S.S.W. from the latter part of May to October, and N.N.E. to N.E. from November to April, being at its maximum in February and March. Generally the monsoons are the better marked the more eastward we go. In the south-west monsoon, between Mindanao and Celebes islands, sudden storms from the N.W. take place.

Much rain falls about Basilan and the north end of Celebes island, whilst fine but overcast and sultry weather occurs in the middle of the Celebes sea.

Molucca passage.—In the Molucca passage the monsoons are strongly marked; the wind rarely blows from the eastward. The northerly monsoon sets in during November, and becomes established in December, the wind increasing in steadiness and veering from N.N.W. to N.E. It is at its strength in February and March, and begins to abate in April, but still bears a decidedly northerly character. In May the winds are variable, beginning to blow from south and S.W., though north-westerly winds are also experienced. By June the south or S.S.W. monsoon is established, and it gradually increases in force and steadiness until August, when its height is attained. In October the monsoon diminishes in strength and northerly winds occur.

Although the monsoons are generally so steady, variable winds are frequent, and there is often rain during both monsoons. The greatest amount of rain falls in June and July, and in a lesser degree in January. September and October are the driest months, after them February and March. Heavy squalls rarely occur; the sky is more clouded than in the Celebes sea.

Molucca sea.—In the Molucca sea the monsoons are well marked and blow from N.N.W. and S.S.E., separated by two months, April and November, in which the monsoons turn; they are pretty strong and steady; there are frequent showers and rather overcast and hazy skies. The S.S.E. monsoon sets in during the latter half of April, and gradually increases in steadiness and force till July and August when both these characteristics are at their height; in October the steadiness decreases and the force grows weaker. In November the wind is more from the S.W. than other directions, but is generally very feeble and cannot be depended on; calms and variable winds frequently occur. In December the N.N.W. monsoon sets in, and the wind may be anywhere in the north-west quarter. In January and February the monsoon is at its height, but neither steadiness nor force are so great as during the S.S.E. monsoon. In March the monsoon begins to abate; in April the weather is unsettled, and the wind may be expected from any direction, though mostly from the N.W.

June, July, and August are the wettest months; September, October, and November the driest. Squalls are more frequent in December and January. Thunder-storms mostly occur at the change of the monsoons in April, May, and November.

Ceram sea.—In the Ceram sea the eastern monsoon, during which S.S.E. winds prevail, sets in about May, but the winds are light and variable and they continue so, more or less, throughout June. In July,

August, and September the monsoon is at its height, but variable winds are frequent; in October, though S.S.E. winds still dominate, the monsoon begins to abate. November is a period of transition between the monsoons, and winds from all quarters are experienced. The western monsoon, when N.W. winds are the most prevalent, blows from December to March, but variable winds are very frequent. In April, W.N.W. winds prevail, though they are of little force, and practically there is no monsoon. The influence of the S.E. monsoon is scarcely felt northward of Ceram, where the wind is generally of little strength, and uncertain in direction.

The rainfall is rather heavy during all months throughout the year, but well-marked seasons do not occur, though a slight maximum is observable from April to June. Heavy squalls are rare. Thunder-storms occur only at the transition-epochs of the monsoons.

Banda sea.—The easterly monsoon sets in during April, when S.E. winds begin to prevail; they become settled and strong in May, continue with unabated force until August, and gradually decrease in strength during September and October. In November S.E. winds still prevail but west and N.W. winds are at times experienced. The N.W., or westerly monsoon, begins in December, is at its height in January and February, and continues with great force and regularity until March; when it decreases considerably but still prevails, though easterly winds occur. March and April may be considered transition months.

The atmosphere is generally very hazy in the northern part of the Banda sea, becoming less dense on proceeding southward, and when well south there is usually a clear sky. In the northern part of this sea the rainfall is pretty heavy throughout the whole year, so that the dry and wet seasons are not sharply defined; the wet season lasts from May to August; the driest months are September, October, and November. In the southern portion of the Banda sea the rainfall appears to be rather heavy from December to February with occasional heavy squalls, and moderate from March to June, while the dry season lasts from July to October or November; it varies greatly, however, in different localities. Heavy squalls and thunder-storms are rare.

Arafura sea.—In the Arafura sea, which separates the north coast of Australia from the chain of islands to the northward, the periodical south-east monsoon (the extension of the south-east trade) and north-west monsoon prevail. The south-east or easterly monsoon, with prevailing S.E. and E.S.E. winds, begins in the latter half of March or early in April with squally, rainy weather, but in a week or ten days it becomes settled, and blows with great steadiness from the latter month to October, attaining its full vigour in June, July, and August, when strong easterly winds may be almost absolutely counted upon. During the strength of the monsoon

there is usually a considerable sea. In October the monsoon begins to abate, and in November cannot be relied on, though S.S.E. winds still prevail when not in proximity to the land. The westerly monsoon begins in December and lasts until February, but its steadiness is not so great as during the easterly monsoon, calms and variable winds occurring frequently; the force of the wind, however, is pretty considerable when the monsoon is at its height. At the beginning of March the monsoon becomes variable, with dark, cloudy, and unsettled weather; the wind is then generally from S.W., but not at all regular.

In the southern part of the Eastern archipelago the south-east monsoon is attended with fine weather, but on the south-west coast of New Guinea, and among the islands to the westward as far as the coast of Celebes, frequent squalls with heavy rain are experienced at this season, often accompanied with considerable swell from the southward, while during the remainder of the year the weather is fine.

The rainy season lasts from November to July, January and March being the wettest months; rain is least frequent in August, September, and October. Throughout the whole year the sky is very cloudy, and showery weather may be expected, especially in the vicinity of the high islands; heavy squalls, mostly accompanied with a downpour of rain, are experienced during the westerly monsoon only, and occur mostly from December to February. Calms are not frequent.

Near the north coast of Australia, between capes York and Van Diemen, the monsoons are not so regular, but take more the character of land and sea breezes, and the nights are mostly calm. In the months of April, May, and June, after a calm night, the land wind usually springs up at daylight from south or S.S.E., gradually becoming more easterly as the sun approaches the meridian, when there is sometimes a light wind from the eastward, or calm; and at other times a fresh sea-breeze sets in from east and N.E. which lasts until sunset, and then falls to a calm, which continues throughout the night, except at a short distance from the land, where there are light winds.

New Guinea.—On the west coast of New Guinea there are also two monsoons, the south-east lasting from April to October, and the north-west beginning at the end of October and terminating towards April. In October the weather is often changeable. In January, near this island, the wind sometimes varies from N.N.W. to N.E. In March, April and May it is squally. From June to September a great deal of rain falls, from October to May the weather is fine and calm, without either cloud or fogs.

GENERAL REMARKS.—From the foregoing the following general remarks on the winds and weather of the Eastern archipelago have been deduced.

North of the equator.—North-easterly winds prevail from December to March inclusive. This is the fine season, the winds blowing strong and steadily except in the Sulu sea, where variables prevail.

Southerly winds prevail from May to September inclusive. This is the wet season, and the winds are variable in force and direction, with bad weather. Sudden and violent squalls from the north-west occur in the Celebes and Sulu seas.

October and November are unsettled months; the north-east monsoon not being fairly established before the middle of December.

South of the equator.—West and north-west winds veering to north-east prevail from November to March. On coasts having a northern aspect, land and sea breezes, with unsettled weather and rain, will be found.

South-east and east winds prevail from May to September, generally fresh and steady, with fine weather on coasts with a northern aspect, but bringing rain and bad weather to coasts open to the southward.

Rainy seasons.—In this archipelago, situated as it is in the vicinity of the equator, and within the regions of calms and doldrums caused by the meeting of the northern and southern wind systems, the wet and dry seasons are not strongly contrasted, as a great amount of rain falls more or less all the year round. The same monsoon is often stormy at sea but fine near the land; as a rule, bad weather with rain is felt on coasts and islands that lie to windward, whilst leeward coasts enjoy fine weather. See Table, page 574.

REVOLVING STORMS.—These storms, which when they occur in the Western Pacific and northern part of the Chinese sea, between the parallels of 9° N. and 45° N., are named **Typhoons**, are most prevalent in the months of July, August, September, and October; from December to May they seldom happen, still they have been known to occur in every month of the year. The September equinox is a very precarious period.

It is an invariable characteristic of revolving storms that in the northern hemisphere they revolve round an area of low barometrical pressure in the opposite direction to the hands of a watch, and in the southern hemisphere with the hands of a watch. The knowledge of this law is most important.

Typhoons are most frequent in the vicinity of Luzon, Hainan, and off the south-west end of Japan. They are said to blow with the greatest fury when near the land, and their violence is not so great when they pass well to the southward of the coast of China.

As a rule, typhoons commence from east to south-east of the Philippines, whence they advance in courses between West and N.N.W. In May their paths are confined to the tropics. In June they trend towards

Hainan island, over Hong Kong and Swatau, or up the Formosa channel. In July, August, and September they become general.

September is especially dangerous, both for the reasons already mentioned, and owing to great irregularity of path caused by the north-east monsoon, which commences in the higher latitudes in fitful puffs. In October they are confined to the tropics by the north-east monsoon; but a few having their origin well eastward of the Philippines, will make for the south-east coast of Japan. In November they blow only between the parallels of 9° to 14° north in the China sea; but, as in October, a few run north-eastward between Liu Kiu and the Benin islands. In the central and northern parts of the China sea their course lies between N.W. by W. and W. by S.; those having much northing generally continuing overland and recurving into the gulf of Pechili. The typhoons travelling between W. by N. and W. by S. usually break inshore. Those that cross the north end of Luzon in the south-west monsoon, either come through the Bashi channel and make their way up the China coast, or else run up the east coast of Formosa, and then hug the North China shore; both these paths are dangerous.

During the latter months of the year, typhoons that enter the China sea after crossing the Philippines in a low latitude occasionally recur to the south-westward; others, after crossing the Philippines, recur in the China sea and re-enter the Pacific, passing between Luzon and Formosa; these latter occur at the beginning and end of the typhoon season, but chiefly in May.

In the typhoons of the summer months, which move towards the W.N.W. or N.W. in the north part of the China sea, and reach the coast in the neighbourhood of the gulf of Tong King, the area over which the winds become strong, with a decided fall in the barometer in front of the centre, is generally small. This is accounted for by the low pressure prevailing over the gulf of Tong King and the continent beyond it. For the same reason the winds in rear are not only stronger but long continued.

In the autumn months (September and October) these conditions are reversed, and in front of the storm the barometer begins to fall, and strong winds blow at great distances from the centre, whilst in rear the area over which the winds are governed by the depression is comparatively small.

In consequence, a vessel in front of a typhoon moving as stated above, will usually get much shorter notice of the advance of a typhoon from the barometer in summer than in autumn, and while in summer the bad weather lasts for a long time in rear, in autumn it improves rapidly when the centre is past and a strong N.E. monsoon sets in.

The winds round a typhoon centre may be said to be composed of cyclonic winds on the one hand and the prevailing wind on the other.

The rate of movement of these storms has been variously estimated at from 5 to 30 miles an hour, the slower movements occurring in the lower latitudes. Mr. W. Doberck, Government Astronomer, Hong Kong, observes: "The average rate of progress of the centre of a typhoon in 11° N. lat. is 5 miles an hour. In 13° it is $6\frac{1}{2}$, in 15° it is 8, in 20° it is 9, in 25° it is 11, in 30° it is 14, and in $32\frac{1}{2}^{\circ}$ N. lat. it is 17 miles an hour."

It should be remembered that these are averages only; great variations may occur.

The most dangerous typhoons have been encountered in the Pacific in a low latitude, say 12° N., and long. 130° or 140° E. They are so small there and move so slowly that it ought to be easy to avoid them on board a steamer. They move west-north-westward, and the safest position is to the south-eastward of them. Such typhoons occasionally appear first in the shape of an arch, at first perhaps whitish in appearance, but soon developing into a dark and threatening cloud. Its dark appearance and the extreme slowness of its motion,—in fact, it does not appear to move at all,—distinguishes it from an arched squall, which is moreover often brighter in the centre. If the direction of the motion of the clouds in it is seen to be nearly perpendicular to the bearing of the top of the arch, then there is no doubt that it is a typhoon.

Hurricanes occur occasionally on the north coast of Australia.

Warnings of approach.—In the China sea the earliest signs of a typhoon are clouds of the cirrus type, looking like fine hair, feathers, or small white tufts of wool, travelling from east or north, a slight rise in the barometer, clear and dry hot weather and light winds.

These signs are followed by the usual ugly and threatening appearance of the weather which forebodes most storms, and the increasing number and severity of the gusts with the rising of the wind. In some cases one of the earliest signs is a long heavy swell and confused sea, which comes from the direction in which the storm is approaching, and travels more rapidly than the storm's centre.

The best and surest of all warnings, however, will be found in the barometer. In every case there is great barometric disturbance. Accordingly, if the barometer falls rapidly, or even if the regularity of its diurnal variation be interrupted, danger may be apprehended.

No positive rule can be given as to the amount of depression to be expected, but at the centre of some of the storms the barometer is often two inches lower than outside the storm-field.

Practical rules.—When there is reason to believe a storm is approaching the two points necessary for the seaman to know, are (a) the direction in which the centre of the storm is situated; and (b) in which semicircle of the storm the vessel is situated.

In order to ascertain these two points it is necessary that the observer should be stationary ; the first thing therefore to be done is to stop head to wind, or heave to, and as it is always wise to assume the vessel may be in the dangerous semicircle, she should be hove-to on the starboard tack in the northern hemisphere, and on the port tack in the southern hemisphere. There should be no hesitation in heaving-to, as the sooner a clear knowledge of the position of the ship in the storm is ascertained the better it will be.

To find the bearing of the centre the observer should face the wind when the centre will be from 12 to 8 points on the right hand in the northern hemisphere, and on the left hand in the southern hemisphere. At the commencement of the storm allow 12 points, when the barometer has fallen three-tenths of an inch about 10 points, and when it has fallen six-tenths of an inch or upwards 8 points.

To ascertain in which semicircle the ship is in, watch carefully the way the wind shifts. If the wind shifts to the right the vessel is in the right-hand semicircle, and if to the left in the left-hand semicircle. This holds good in both hemispheres.

If the ship is in the right-hand semicircle she should if in the northern hemisphere remain hove-to on the starboard tack, but if in the southern hemisphere run with the wind on the port quarter until the barometer begins to rise.

If the ship is in the left-hand semicircle she should if in the northern hemisphere run with the wind on the starboard quarter, but if in the southern hemisphere remain hove-to on the port tack.

If in the direct track of the storm the wind will, without change of direction, increase rapidly in force, whilst the barometer continues to fall, and then the most advisable course to pursue is to run with the wind on the starboard quarter in the northern hemisphere, and on the port quarter in the southern hemisphere until the barometer has ceased to fall.

In all cases act so as to increase as soon as possible the distance from the centre ; bearing in mind that the whole storm-field is advancing.

In receding from the centre of a storm the barometer will rise and the wind and sea subside. See the Barometer Manual for full details.

The following table, giving the number of typhoons that occurred at Hong Kong during the years 1886–1899, will show the probability of a typhoon being encountered in these seas, in any particular month :—

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1	0	1	4	10	24	45	43	57	31	22	6	244

GALES sometimes blow steadily from E.N.E. or N.E. several days at a time, in September and October, near the south-east coast of China. In the same months they are liable to happen on the west coast of Luzon. Here they mostly commence at North or N.W., and veer to West, S.W., or South, blowing strongly from all these directions, with heavy rain, and a cross turbulent sea; but they seldom continue long.

In May, June, July, and August, severe gales are at times experienced in the north-western part of the China sea, particularly between lat. 14° N. and Hainan island, the approach to Tong King gulf. These gales generally begin at N.N.W. and blow with violence out of the gulf, accompanied by dark weather and a deluge of rain; from N.W. they shift to West and S.W., still blowing strong, and abate as they shift more southerly. When these N.W. gales are blowing in the vicinity of Hainan and the coast of China, strong S.W. or southerly gales generally prevail at the same time, in the middle of the China sea.

With respect to the gales of the Philippines, Captain Villavicencio, who studied the subject during many years, remarks:—"The gales of the Philippines may be separated into three classes, known by the local names of Colla, Nortada, and Baguio. The *colla* is a gale in which the wind blows constantly from one quarter, but with varying force, and alternations of violent squalls, calms, and heavy rain, usually lasting at least three days; these gales occur during the south-west monsoon, and their direction is from the south-west quarter.

"The *nortada* is distinguished from the *colla* in that the direction of the wind being constant also, the force of it remains steady as well, without the alternations of passing squalls with calms at intervals which characterise the *colla*. The *nortada* is nearly always indicative of a typhoon passing not very far off. These gales occur chiefly in the northern islands, and their direction, as the name implies, is from the northward.

"*Baguio* is the local name for the cyclonic storm known as *typhoon* in the China sea, and has already been described."

STORM SIGNALS.—See page 67.

CURRENTS AND TIDES.*

Equatorial currents.—The waters of the Pacific ocean between the parallels 26° S. and 24° N. have a regular motion from east to west which is known as the equatorial current; this at a little to the northward of the equator would appear to be divided into the north and south equatorial currents by the equatorial counter-current, a stream flowing

* See Admiralty Current charts for the Indian and Pacific Oceans, &c.

from west to east throughout the Pacific ocean. The currents in the western parts of the Pacific to the northward of the equator are affected by the monsoons, and to the southward of the equator they are deflected by the east coast of Australia.

Japan stream.—The trade-drift, which flows to the westward between the parallels of 9° and 20° N., on reaching the eastern shores of the Philippine islands, recurves to the northward, forming near the northern limit of that group the commencement of the Japan stream. The main body of the current then flows along the east coast of Formosa, and from that island pursues a north-easterly course through the chain of islands lying between Formosa and Japan, sweeps along the south-eastern coast of Japan, and continuing in the same general direction is known to reach the parallel of 50° N.

The limits and velocity of the Japan stream are considerably influenced by the monsoons in the China sea, and by the prevailing winds of the corresponding seasons in the Yellow and Japan seas; also by the various *drift-currents* which those periodic winds produce. These variations are exhibited on the Admiralty current charts, which embody, in a graphic form, all the most reliable information we possess. For further details of this current, see China Sea Directory, Vol. III.

Equatorial current and Counter current.—The westerly equatorial drift in the North Pacific, caused by the North-east trades, extends towards the equator from about lat. 25° N. on the eastern side, to lat. 20° N. as the Asiatic islands are neared. In the South Pacific that caused by the South-east trades will generally be found to extend from about lat. 20° or 25° S. to and considerably northward of the equator, its further southern limit being towards the American side of the ocean. Near the equatorial limits of these currents, the set is almost due west (true), but between them is the counter equatorial current setting in the opposite direction and sometimes with considerable strength.

Though the limits of the counter current are imperfectly defined, it appears to lie always northward of the equator, generally between the parallels of 4° and 9° N. lat., more commonly between 5° N. and 8° N., though sometimes its influence has been felt almost down to the equator, and it never exceeds five degrees in width. It varies greatly in strength, running from half a knot to 2 knots an hour, and so far as is known with the season also, being stronger from May to October than during the other half of the year, when it sometimes appears to cease. A little to the westward of the Caroline islands during the north-east monsoon, the current sets to S.W. and W.S.W. and forms a prolongation of the northern equatorial current.

The south equatorial current flows to the westward between the parallel of 24° S. and the equatorial counter-current, and extends through the Solomon group to the north-eastern coasts of New Guinea.

The lines of division between the equatorial and counter equatorial currents are sometimes distinctly marked, the streams of the former being generally at their greatest strength when near these lines of division.

The Rossel current is a branch of the south equatorial current and receives its name when near the meridian of 175° W. It passes to the southward of the Fiji islands, and when between them and New Caledonia, sets N.N.W. towards the Solomon group, and N.W. as far as Torres strait, with an average rate of 8 or 10 miles a day.

China sea currents.—The principal currents in the China sea are the north-east and south-west monsoon drifts. They are both very changeable, their direction and velocity depending much upon local circumstances, but that during the north-east monsoon is the stronger and the more constant.

North-east monsoon period:—The current in the China sea during the north-east monsoon, generally runs to the south-westward, with a velocity depending on the strength of the wind. When the force of the monsoon is abated, or during moderate and light breezes, there is often little or no current.

The current on the western side of the great mass of reefs included between Prince Consort bank and North Danger reef is usually slack, even during the strength of the monsoon, and at other times is setting to windward, more especially near and towards the northern reefs. When H.M.S. surveying vessel *Rifleman* was at anchor in the reefs, during both monsoons, careful observations were taken of the direction of the current, which, for 16 hours out of the 24, invariably set to windward, generally with the greatest force when the monsoon was strongest.

Between the south end of Formosa and the north end of Luzon, when strong north-east winds prevail the direction of the current is generally from S.W. to south; but in light variable winds it often sets to the northward. On the west coast of Luzon the current is changeable, sometimes setting southward along the coast, at other times northward, but generally with a tendency towards the coast. On the coast of Palawan it is also governed by the prevailing winds, but seldom runs strong in any direction, unless impelled by gales.

South-west monsoon period:—Late in April, or early in May, the current generally begins to set to the northward, in the southern and middle parts of the China sea, and while the south-west monsoon is strong continues to run in a north-easterly direction until September; but it is not constant in this monsoon, for at times, when the wind is moderate or

See Admiralty Current charts for the Indian and Pacific Oceans, &c.

light, it is liable to change and set in various directions. After the strength of the monsoon has abated, there is often little or no current in the open sea, running to the north-eastward; and sometimes its direction is to the southward.

On the coasts of Luzon and Paláwan, the current generally sets to the northward and towards the land in the south-west monsoon, but frequently there is no current, and near these coasts it seldom runs with much strength. Occasionally a slight south-westerly set will be experienced in the Paláwan passage during this monsoon. Near the Bashi islands it sometimes sets eastward when strong westerly winds prevail; but generally strongly to the northward, or between N.N.W. and N.E. For further details see *China Sea Directory*, Vol. II.

Sulu sea.—During the north-east monsoon in the Sulu sea the current runs regularly in the direction of the wind, and varies in strength according to the force of the wind. In the early months of this monsoon, when the wind blows strongest, the current runs with the velocity of a mile an hour, decreasing to about half a mile an hour in May. In June the current reverses with the wind. Between Sulu and Sandakan, in October and November, the current has been found to set south at the rate of from one to $1\frac{1}{2}$ knots an hour.

In the Molucca passages the current sets with the wind, its strength depending very much on the force of the wind, seldom exceeding a knot an hour. During the north-east monsoon of the northern hemisphere it appears to be stronger on the east coast of Celebes than on the west coast of Gillolo. On the north coast of Ceram counter-currents prevail close in shore during the south-east monsoon of the southern hemisphere.

Banda and Arafura seas.—During the south-east monsoon the current sets to the north-west along the western coast of New Guinea, and between the Ké and Aru islands, and thence westward along the south coast of Ceram, at the rate of one or $1\frac{1}{2}$ miles an hour, according to the strength of the wind, the velocity being greatest along the coast of New Guinea. At the same period an easterly current prevails on the north side of the Serwatti islands, between Timor and the Tenimber group, setting to windward, so that a moderately fast-sailing vessel would experience no difficulty there in beating up against the monsoon. In the north-west monsoon, the current in these seas usually sets with the wind.

North-west coast of Australia.—The current here generally sets with the wind, but is somewhat uncertain, both in strength and direction, being complicated with the strong tidal streams which prevail on that part of the coast.

See Admiralty Current charts for the Indian and Pacific Oceans, &c.

TIDES.—China sea.—The observations on tides in the China sea are neither numerous enough nor complete enough to permit of accurate generalisations being made for the whole area. The following remarks, however, based on the existing evidence, afford some idea of the general tidal movement.

They are affected by a diurnal inequality, especially of height, causing a difference between the heights of successive high and low waters, which varies throughout the lunation, and sometimes attains large proportions.

The difference may be almost imperceptible, or may be so great that the movement of the water between the lower high water and higher low water is reduced to a mere stand in the level of the water, giving the effect of only one high and low water during the 24 hours.

The time of high water is generally the most regular feature of the tides and follows the time of the moon's transit as usual.

Spring tides depend upon the opposition and conjunction of the moon and sun (full or new moon), and also on the attainment by the moon of her higher declination north or south.

The effect of these two positions of the moon is about equal on the tide, so that when the moon is either new or full, at the same time that she is, in high north or south declination, the spring tide is high and well defined. When the new or full moon occurs when she is on the equator, the spring tide is sometimes almost lost.

This is equivalent to saying that the higher and best defined spring tides occur about the solstices (June and December), and the lower and least defined about the equinoxes (March and September).

The higher water of each day follows either the superior or inferior transit of the moon when she is on one side of the equator, and the opposite transit when she is on the other side of the equator. The particular transit followed by the tide varies in different localities.

On the north-west coast of Borneo; among the Philippine islands; and in the Tong King gulf, when the sun has north declination, the higher tides about springs occur during the day, and when it has south declination, during the night.

The mean tide level on the different coasts varies during the year; on the coast of Luzon it is lowest in February and highest in August; in the Tong King gulf it is highest during the north-east monsoon, or from November to March; and about Kin Hon, on the coast of Cochin China, it is lower in May and June than in March.

Throughout the Eastern archipelago the tides are largely affected by diurnal inequality. At Ubian island in the Sulu sea, near the equinoxes there are two complete tides in each 24 hours, near the solstices only one tide in that time. When the sun has north declination the higher high tide is in the day time, and at night when it has south declination. In the

channel between the Sulu islands the tidal streams are strong and irregular, and overrun the times of high and low water by from 2 to 3 hours.

The observations on the tides in the Molucca and Banda seas are too few to afford data for generalisation.

The set of the tidal streams in the Arafura sea is not well known, but they do not appear to be strong. The stream caused by the advancing undulation enters the sea from the eastward through the Torres strait, and from the north-west by the Aru islands. Observations are wanting as to the streams between Timor Laut and Timor; but south of Timor the rising stream sets towards the east.

On the north coast of Australia the stream sets to the eastward with a rising tide between cape Croker and cape Wessel, but in the offing of port Essington and Popham bay it sets to the westward, the stream entering Van Diemen gulf from the northward through Dundas strait, and from the westward through Clarence strait, with the rising tide. The set and turns of the streams in Dundas strait are not well known; during springs they run with great strength. The stream enters Dundas strait from the northward with the rising tide, and after passing cape Don sets to the south-east. The stream with the falling tide sets to the northward out of the strait.

On the north coast of Australia the tides are subject to great diurnal inequality. At port Darwin, in August, it was observed that high and low high-tides, also high and low low-tides, followed each other alternately. At new moon the tide rose higher and fell lower than at full moon. This would be reversed in the other season. Southward of port Darwin the diurnal inequality is scarcely felt in some places, there being regular half-day tides.

The Philippines.—The following information concerning the tides of the Philippines is extracted from the Spanish Derrotero:—

The tides of Manila, Iloilo, Surigao strait, and Balábac follow the general laws before stated. Two or three days after the moon has crossed the equator, two high and two low tides are observed in the 24 hours, of nearly equal amplitude; during the following days one tide increases in amplitude, and the other decreases until but one occurs in the 24 hours.

Two or three days after the moon has attained its greatest declination, either north or south, the single tide that exists attains its maximum. It then decreases in amplitude with the declination of the moon; soon, a second tide appears, the amplitude of which increases as the other lessens, and the two tides are equal two or three days after the moon has recrossed the equator; then, the first continues to lessen while the second increases until again there is but one tide in the 24 hours.

There can hardly be said to be a regular "establishment," as it varies daily for each of the two diurnal tides according to the positions of sun and moon; but, in the Appendix, a table is given in which may be

found the approximate tide hour for each day of the year at Manila, Iloilo, and Balábac.

The tides on the south coast of Mindanao present the following peculiarities:—the diurnal wave is propagated more slowly than the semi-diurnal, and increases in amplitude on advancing from Davao to Basilan strait, whilst the semi-diurnal wave decreases in amplitude. The diurnal inequality makes itself very apparent in the heights of the flood-tides, and in the hours of the low-tides, and is but little apparent in the height of the low tides and the hours of the flood tide.

As a result of these laws and of the values of the diurnal inequalities there are at Davao and Pollok always two tides daily, except at the time of certain equinoctial quarters, when the moon has a maximum declination. At Samboānga there will generally be two tides daily, but one only at every equinoctial quarter. At Isabela the difference is more marked: there are some years (being those in which the moon attains its greatest declination) in which the number of days having but one tide in the 24 hours exceeds the number of days having two tides. In all cases, however, there are always two equal tides in the 24 hours one or two days after the moon has passed the equator.

In the course of one day the higher high tide, when there are two, and the single high tide when there is only one in the day, is that which immediately follows the hour of the moon's superior or inferior transit according as her declination is south or north.

In the Appendix a table is also given for finding the approximate tide hour for each day of the year at Davao, Pollok, Samboānga, and Isabela.

DOCKYARD.—There is a Government dockyard at Manila (Kavite) containing requisites for repairs of every kind needed by steamers or sailing vessels. There is here also a small Government slip, with a lifting power of 300 tons; and a larger patent slip, with a lifting power of 2,500 tons.

Docks.—There is no docking accommodation at any of the ports included in this work. For nearest docks, *see* China Sea Directory, Vols. II. and III.

COAL.*—Large supplies of coal are obtainable at Amboina, Port Darwin, Koepang in Timor, Labúan, Manila, and Thursday Island. Small supplies may be had at Babar in the Serwatti islands, Dorei in New Guinea, Iloilo, port Isabela, Kema, Kudat, Sandakan, Sebu, and Fernate; and possibly a limited quantity at Dobbo in the Aru islands, and at Gisser in Ceram Laut. For details, *see* the body of the work.

STANDARD TIME.—The time kept in the Philippine islands is that of the meridian of 120° E., or 8 hours fast on mean time at

* *See* Admiralty Coal and Telegraph chart, No. 1,188 [3,476].

Greenwich. At Manila the Observatory time ball is dropped at noon standard mean time. At Iloilo and Sebu, a signal is received from Manila at the instant of eleven o'clock a.m. standard time.

In South Australia, part of the Northern Territory of which falls within the limits of this work, the standard time kept is that of the meridian of long. $142^{\circ} 30' E.$, or $9\frac{1}{2}$ hours fast on Greenwich mean time.

INTERNATIONAL CODE SIGNALS. — On and after 1st January 1902 the use of the Old edition of the International Code of Signals is to be discontinued, and the New edition *only* used.

The code pennant will be hoisted in the ordinary way, without the black ball.

COMMUNICATION. — **Philippine islands.** — The Spanish Trans-Atlantic Company run monthly between Manila and Liverpool, *vid* Spain, and are the only regular line carrying goods to England without transshipment. British steam-vessels run regularly at intervals of three or four days between Manila and Hong Kong, occasionally calling at Amoy. Steam-vessels run between Manila and Saigon twice a month. The British India Company's vessels call every three weeks on their way from Calcutta to Japan, and, with the exception of the Spanish mail and one or two small German steamers, are the only vessels running direct between Manila and Singapore. Communication with Australia is kept up by a Japanese mail line, and by two small British lines owned in Hong Kong. There is a regular line running direct from Hong Kong to Sebu.

No regular line of steamers has yet been started (July 1901) under the American flag between the Philippines and the United States. American transports run at frequent intervals between Manila and San Francisco.

Local traffic among the Philippines is carried on by about twenty steam-vessels, having their head-quarters at Manila. One line runs from Manila to ports on the north-west coast of Luzon twice a month; another from Manila, through Verde island passage, to ports on the south coast of Luzon, and through San Bernardino strait to Albay and Tobako, twice a month; a third line calls at the ports in Panay island, Sebu, and Leite, as far as Takloban, twice a week. Besides the above, there is frequent communication between Manila and Iloilo.

A steam-vessel runs monthly from Manila to Iloilo, Samboanga, the ports in the Sulu archipelago, and the southern ports of Mindanao to Pujada bay. A small steam-vessel calls at port Kulion in the Kalamianes, Cuyo, and Paláwan, once a month, on her passage to Kagayan-Sulu, Sulu, and Samboanga, and again on her return voyage.

North Borneo is in communication with Labúan and Singapore once a week, with Hong Kong about three times a month, and with Sulu about twice a month.

Dutch colonies.—From Batavia and Surabaya there is contract service by the vessels of the Netherlands India Co. every four weeks to Makassar, Amboina, Banda, Kayeli, Bachian, Ternate, Gorontalo, Manado, and ports on the north and west coasts of Celebes, back to Makassar and Surabaya. There is also non-contract service every four weeks from Surabaya to Makassar, islands east of Java, Dilbi Timor, Banda, Amboina, Bachian, Ternate, Lirung, Taruna, Sian, Gorontalo, Manado, and back to Makassar. The voyages are made from Makassar alternately in opposite directions.

From Surabaya a vessel makes the round every eight weeks to Makassar, Amboina, Banda, Gisser, Fak Fak, Ké islands, Dobbo, Larat, Seira, Tepa, Damna, Letti, Kissa, Banda, Amboina, and Makassar. The voyages are made from Banda alternately in opposite directions.

From Amboina there is contract service every twelve weeks to Wabai, Ternate, Gani, Patani, Saonek, Samatti, Sorong, Dorei, Roon, Ansus, Jamna, Humboldt bay, and back to Amboina, calling at the same ports. Also from Amboina every twelve weeks to Banda, Gisser, Segaar, Fak Fak, Dobbo, 141° east longitude on the south coast of New Guinea, and back to Amboina, calling at the same ports.

North Australia.—The Eastern and Australian Steamship Company's vessels, as also those of the China Steam Navigation Company, and of the Adelaide Steamship Company, call at port Darwin about once a month, the latter connecting with the Western Australian ports. In addition, there is inter-colonial service between port Darwin and Roebuck bay, Wyndham, and Borroloola.

RAILWAYS.—There is a railway between Manila and Dagupau, a distance of 123 miles. In the Northern territory of South Australia, a railway from Palmerston to the interior is completed as far as Pine Creek, a distance of 146 miles.

TELEGRAPHS.—Manila is connected with Hong Kong by submarine cable, and is thereby joined to the universal telegraphic system. A submarine cable also unites Manila with Iloilo in Panay, and cables are continued to Negros, Sebu, Leite, Mindanao, Sulu, &c., thus bringing all the principal islands into telegraphic connection with Manila. Sandakau is connected by land line with Mempakol on the north-west coast of Borneo, and thence *via* Labúan with Singapore and Hong Kong. Port Darwin is connected by two submarine cables with Banjuwangi in Java, thence with Europe, &c. *via* Singapore.

DIRECTIONS FOR MAKING PASSAGES.*

General remarks.—Towards the centre of the lower portion of the China sea, there is a considerable area of unsurveyed and dangerous

* See Admiralty charts, Nos. 1,077 [3,474] and 1,078 [3,475]; also "Ocean Passages."

ground, known to be encumbered with coral reefs and banks, which should be avoided by all vessels. They are recommended to follow the routes shown on the charts, as far as practicable.

MANILA to EUROPE. — Steam-vessels, full-powered and auxiliary, proceed from Manila to Singapore by China sea route or by Paláwan passage, according to the monsoon, and thence, *viâ* Sunda strait, across the Indian ocean for the Suez canal. For a detailed description of the Chinese sea route and of the Paláwan passage, *see* China Sea Directory, Vol. II., 1899.

China sea route.—During the north-east monsoon, a vessel on leaving Manila bay should steer to pass northward of the central dangers in the China sea for Pulo Sapatu, and thence direct to Pulo Aor and Singapore.

Paláwan passage route, along the west coast of Paláwan island and the north-west coast of Borneo, may be taken during the south-west monsoon by steam-vessels of but moderate power wishing to avoid the strong adverse currents of the China sea.

Sailing vessels.—During the strength of the north-east monsoon sailing vessels can take the route across the China sea north of the central dangers to Pulo Sapatu, making every allowance for the south-westerly set. In passing Pulo Sapatu they should borrow to the eastward towards the Prince of Wales and other banks, where the winds are more favourable than farther to the westward, and then steer for Gaspar and Sunda straits. In March, April, and May sailing vessels are recommended to take the Paláwan passage, as they are then likely to carry easterly winds with fine weather and a smooth sea to Carimata strait.

During the south-west monsoon sailing vessels should make through Mindoro strait or Verde island passage, Basilan strait, or Sibutu passage, and Makassar strait to Sunda strait. If unable to make Makassar strait, they can steer for Molucca passage, and pass east of the Sulu islands, and Buru; but in this case it will be better to enter the Indian ocean by Ombai strait.

EUROPE to MANILA. — Steam-vessels generally call at Singapore, whence during the north-east monsoon, October to February, those of lesser power take the Paláwan passage. During the south-west monsoon, March to September, the main route up the China sea is followed until northward of the central dangers, when a direct course is steered for Manila.

Sailing vessels, when the north-east monsoon is blowing in the China sea, should enter the Eastern archipelago by Lombok or Ombai strait, and pass into the Celebes sea by Makassar strait; thence through Sibutu passage, or one of the Sulu passages, to Manila.

During the south-west monsoon a sailing vessel can enter the strait of Sunda, and thence take the Banka, Gaspar, or Carinata strait, into the China sea as far as lat. 12° N., when she may strike across for Manila.

PHILIPPINES to AMERICA.—Vessels bound to the west coast of North America and Panama would in either monsoon do best to pass up the west coast of Luzon, through the Bashi channel, east of Formosa, into the Japan stream (Kuro Siwo), and reach the region of westerly winds in lat. 35° N. without loss of time. The route then follows the arc of a great circle as closely as possible, running up as high as 48° N. from April to November, and keeping between lat. 40° and 45° N. from November to March. Here both winds and currents are favourable.

If bound to Valparaiso or the ports of South America, staunch auxiliary steamers will find it to their advantage to go south of Australia. They can fill up with coal at Singapore or Batavia, then pass into the Indian Ocean through Sunda or Alas strait, and make south for the steady west winds; these once found, head S.E. for the parallel on which it is intended to make easting.

Sailing vessels are recommenced during the south-west monsoon to take the northerly route by the Bashi channel, as indicated above for North America. Maury recommends vessels to follow this route as far as long. 152° E., then to cross the equator in 172° E., and pass either east or west of New Zealand into the westerly winds; Horsburg and Becher recommend vessels to get into long. 165° to 170° E. before they stand across into the trades.

During the north-east monsoon a shorter route, but with less favourable winds, is to pass down the Sulu sea through Basilan strait, then north of New Guinea, keeping between the trades, and north of the equatorial currents in lat. 2° to 4° N. as far as the Gilbert islands, and then to steer S.E. for the westerly winds.

Another route during the north-east monsoon is from Basilan strait through the Molucca channels and Torres straits, with the north-west winds that prevail south of the equator. (See "China sea to Torres strait," page 34). After clearing Torres strait by Bligh entrance, continue along the southern coast of New Guinea and the Louisiade archipelago until far enough east to cross the trades into the westerly winds. Vessels running north of New Zealand will have a quicker passage, but it will be difficult to double cape Otou at this season unless advantage be taken of every chance for making to the eastward as well as southward.

WEST COAST of AMERICA to the PHILIPPINES.
—Steam-ships and sailing vessels.—From North America all vessels proceeding west will almost of necessity stand to the southward

and westward for the north-east trades. In summer and autumn they need not go so far south for steady trades as they do in winter and spring.

Between May and October, on gaining the trades, vessels should make westing on about the parallel of 20° N., as far as the Marianas. Thence full-powered steam-ships bound for Manila might keep on through the Bashi channel and round the north point of Luzon. Sailing vessels, however, and vessels bound for Iloilo should pass south of the Marianas and steer for San Bernardino strait with the N.E. winds. These will gradually change to variable winds with squalls, and then to the south-west monsoon as the vessel approaches the Philippines. For entering San Bernardino strait *see* Chapter VIII.

Between November and April vessels should make their westing about the parallel of 15° N., and, if bound for Manila, should pass north of the Marianas and enter the China sea by the Bashi channel.

If bound to Iloilo they can enter by San Bernardino strait.

From South America the passage may be made by using either the north-east or the south-east trades. These two routes are called respectively the northerly and the southerly route. The former is preferred by vessels leaving Valparaiso or Callao from August to February; the southerly is the better route during the remainder of the year.

Northerly route.—After leaving Valparaiso or Callao steer through the south-east trades so that the equator may be crossed in about long. 138° W., and lat. 10° N. in about 143° W.; the north-east trades will be found near this parallel; thence continue as from North America.

Southerly route.—On leaving Valparaiso steer N.W. into the settled trades. These found, the route should be by the Marquesas, south of the Gilbert group, and to the northward of the Pelew islands. After this, shape course according to season as described above.

Auxiliary steam-ships can shorten the southern route by passing to the southward of the Paumotu archipelago, and after reaching about long. 158° W. they can pass between the Samoa and Tonga islands; but it often happens that calms or westerly winds are met with south of the Paumotu group.

CHINA SEA to the EAST COAST of AUSTRALIA.—Full-powered steam-ships should take the Torres strait route in both monsoons. *See* page 34, "China Sea to Torres strait."

In the N.E. Monsoon.—Vessels with auxiliary steam can also take the Torres strait route, or they can take the passage west and south of Australia. In this case they pass down the China sea and between the Great and South Natunas to Carimata strait, thence through Lombok, or Alas strait into the Indian ocean. They should then stand to the southward, profiting by the changes of wind which in this season are

generally from S.S.W. and S.S.E. between the straits and the trade winds; cross the zone of the trade winds and get into the variables of the southern hemisphere; they will then speedily make up their easting.

Sailing vessels should take the route west and south of Australia as above. From Hong Kong or Saigon they can pass down the China sea; but from Manila, especially in March, April and May, they had better take the Paláwan passage, then by Carimata and Lombok or Alas strait into the Indian ocean. For particulars of Carimata strait the mariner is referred to the China Sea Directory, Vol. I.

In the S.W. monsoon, vessels with auxiliary steam may take the Torres straits route if they have coal endurance to steam from Amboina, where they can fill up with coal, to Torres straits; otherwise, they can follow one of the eastern routes for sailing vessels. They can pass through the Bashi channel into the Pacific, passing on either side of the Pelew islands, according to the extent of the south-west monsoon to the eastward; and, having gained the equatorial counter current between the parallels of 4° and 8° N., make easting until far enough to proceed through the Solomon group and Coral sea, and thence to the southward. Or they may pass through Mindoro and Basilan strait and then make easting between 4° and 8° N. far enough to fetch the Solomon islands, and thence proceed south to Australia. For particulars of the last part of the voyage see "Pacific islands," Vol. I., and "Australia Directory," Vol. II.

Sailing vessels are recommended by Captain Becher to take one of the eastern routes just described, but in the "Navigation of the Pacific Ocean, China Seas, &c.," U.S. Hydrographic Office, sailing vessels and auxiliary steam vessels are advised to follow the route from China to Europe during the south-west monsoon, viz.: by Mindoro and Basilan straits; thence, through Makassar strait and the strait of Sunda; or, Molucca passage, Salayar and Lombok straits; or through Gilolo passage, Manipa and Ombai straits into the Indian Ocean, and afterwards to pass westward of and then round the south end of Australia.

CHINA SEA TO TORRES STRAIT.—The route now generally adopted is:—from Hong Kong to steer across the China sea for Mindoro strait, and to pass about 4 miles west of cape Kalavite; thence through Apo East Pass between Apo reef and Mindoro island—a safe and good channel. Then proceed through the Sulu sea, between the Cuyos islands and Sultan bank, east of Sombrero island and 6 miles west of Nogas island off the south-west end of Panny; from this point a southerly course should be steered for the south-west extreme of Mindanao and Basilan strait, leaving the Sultana and Nicholson banks, on which there are depths of $2\frac{1}{2}$ and 3 fathoms to the westward.

In passing through Basilan strait, either channel north or south of Santa Cruz island may be taken, but the northern is preferred. On leaving the strait, a S.E. by S. course should be steered for Banka passage between Biarro and Banka islands off the north-east point of Celebes. Then proceed southward through the Molucca pass between the Sulu islands and Obi Major, and through Manipa strait, from whence steer about S.E. by E. $\frac{1}{2}$ E. across the Banda sea for the Arafura sea, passing between the Ké and Aru islands to the north-eastward, and the Tenimber islands to the south-westward. Mano island, lying near this track, is a volcanic island 880 feet in height, and has no dangers in its vicinity, but the south-west part of the Aru islands must not be approached within 15 miles, as the Blackburne shoals, with only one to 3 fathoms water over them, lie some 10 miles off the coast, and are not indicated by breaking or ripples at ordinary times.

From the Arafura sea a course should be steered to pass south of Proudfoot shoal at the western entrance of Torres strait, and then through Torres strait as directed in the *Australia Directory*, Vol. II.

North of Ceram to Torres strait.—In order to escape the south-east monsoon during the months of July and August, when it blows strong and raises a high sea in the Arafura sea, some steamships, after passing Obi Major, have taken the passage north of Ceram, the Ké, and Aru islands, passing cape Valshe at a distance of 30 miles, as mud banks extend to a great distance from the cape. This passage has the advantage of smooth water but is a little longer and less well-known than the passage through the Banda sea.

CHINA SEA to PORT DARWIN.—The same route as above should be followed as far as Manipa strait, whence a course S.S.E. $\frac{1}{4}$ E. should be steered to pass east of Turtle and Damma islands, and between Sermattan and Babar islands; and from Sermattan S. by E. to round cape Foureroy. Shoals having been reported to the southward of cape Foureroy, it should not be brought to bear north of N. by E. whilst within a distance of 8 miles. After clearing the cape a course may be shaped for Port Darwin, proper allowance being made for the tides, which run very strong during the springs, the flood to the eastward, and the ebb to the westward.

VERDE ISLAND PASSAGE.—Vessels will find the route east of Lubang island, through Verde island passage, and along the east coast of Mindoro, preferable to that through Mindoro strait. The whole track is clear, but caution must be used in the vicinity of Bakos islets, south-east of Verde island. This is a favourite route during the north-east monsoon for vessels coming from the southward, which get north under the lee of Negros and Panay, and from the north-west point of

Panay proceed between Mindoro and Tablas islands to Dumali point, and then on through Verde island passage and up the west coast of Luzon, thus escaping the strong monsoon that is generally felt on clearing Lubang islands.

Westward of Cuyos.—During the south-west monsoon of the China seas, steamers have passed from Basilan strait west of Kagayanes and Cuyos islands, and through Apo west pass into the China sea, and H.M. ships have also used the passage from the China to the Sulu seas between Kalaianes and Linapakan, and between Linapakan and Paláwan, but these channels have not yet been properly surveyed.

SULU SEA from the Westward.—Balábac strait, between the islands of Balábac and Banguay, north of Borneo, is taken by vessels proceeding from Singapore to the southern part of the Sulu sea. The general description of the islands of Paláwan and Balábac, and of the reefs in the vicinity, will be found in the China Sea Directory, Vol. II.; but, for the convenience of vessels proceeding to the Sulu islands, or to Basilan strait, the main channel is described in this work.

South Banguay channel and Mallawallé strait, between Banguay island and Borneo, are sometimes used by vessels navigating to the ports on the north-east coast of Borneo; they are somewhat intricate and demand careful navigation, being for the greater part bounded by dangers. The description of these channels will be found in the chapter on the north-east coast of Borneo. Balábac main channel is recommended in preference to either of these channels, being considered much safer.

Sibutu pass.—Vessels entering the Sulu sea from Makassar strait will find it convenient to use the channel between the Sibutu islands, south of Tanjong Unsang, which is the easternmost point of Borneo, and Tawi Tawi island. This channel is 18 miles wide, quite safe, and easy of navigation both by day and night; but the tidal streams set through the channel with great force.

MANILA to ILOILO.—Vessels can take the Verde island passage to Dumali point, and then steer either south along the west coast of Panay, which is considered the best route during the north-east monsoon, or from Dumali point they may steer to pass south of Simara island, and between Tablas and Romblon, then on between Jintotolo and Zapatos islands, and then, turning southward, proceed along the east coast of Panay to Iloilo. This latter route is the one preferred during the south-west monsoon.

MANILA to SEBU.—The same route would be taken as far as Jintotolo island; from there proceed to Malapascua, which lies north-west

of Sebu island, and thence south to Sebu. The details of these various routes are given in Chapters V. and VI.

MANILA to HONG KONG and BACK. — Full-powered steam vessels make the passage direct, in both monsoons.

During the north-east monsoon auxiliary steamers and sailing-vessels should keep along the coast of Luzon, about 3 miles distant, as far as cape Bolinao; and thence stand across for the Lema channel, south of Hong Kong. But with north-east or northerly winds, in a sailing-vessel, especially if not a good sailer, the coast should be kept as far north as cape Bojeador before standing across for China.

During this monsoon there is a current to the northward between Manila bay and cape Bolinao; and between cape Bolinao and the Pratas shoal a current to the north-west, setting a vessel sometimes as much as 30 or 50 miles a day.

If bound to Manila from Hong Kong in the north-east monsoon, auxiliary steamers and sailing-vessels after passing through the Lema channel should keep as far eastward as possible, and make for the north-west coast of Luzon towards cape Bolinao. At this season the current sets strongly to leeward, but is found to decrease as the vessel nears Luzon. Having reached the latitude of the cape the vessel should proceed, at a safe distance, along the coast for Manila bay.

During the south-west monsoon a vessel leaving Manila for Hong Kong should steer direct for Lema channel or the Great Ladrone, making due allowance for the lee current. According as the wind, on approaching the coast, is south-west or inclines east, so one of the more weatherly channels between these islands should be entered.

If bound to Manila in the south-west monsoon take every possible advantage of the wind veering to S.E. or east to make southing. From the Macclesfield bank a vessel is sure of reaching Manila. If passing to windward of Scarborough shoal, caution is necessary on account of the lee current.

MANILA to SAIGON. — During the north-east monsoon the route is direct for steam-ships and sailing vessels, making allowance for the current which sets with the wind.

During the south-west monsoon full-powered steam-ships may take the direct route. Sailing vessels will find the voyage long and trying whichever route they adopt. The Spanish Derrotero recommends the following:—On leaving Manila bay take the Verde island passage, pass down the east side of Mindoro and the west coast of Panay, cross the Sulu sea passing out by Balábac strait, and work down the north-west coast of Borneo to make westing; then cross the China sea south of the Paláwan shoals.

SAIGON to MANILA.—During the south-west monsoon the route is direct and the wind fair, but during the north-east monsoon the passage will be long and tedious for a sailing vessel. Captain Polack gives the following directions for the period of the latter monsoon, which are also incorporated in the Spanish Derrotero :—Stand out to the south-east, and tack when 40 miles from the land (even if the wind be from east), in order to keep to the westward of the current, but on no account endeavour to work up along the coast of Cochin China. When the wind hauls E.N.E. or N.E. try to cross the south-west current as quickly as possible, for at about 150 miles S.E. by E. from Cape St. James the current runs east and E.N.E.; then work up at the distance of between 20 and 70 miles to the westward of the Paláwan shoals from lat. 9° N. as far as North Danger with the aid of the N.E. and northerly current. From North Danger it is very probable that an easterly current will favour the last part of the voyage.

For a well found sailing ship this route is without doubt the shortest and best, but dull sailers and steam-ships would do better to take the Paláwan passage, in which even during the height of the monsoon the wind is frequently light, and steamers can make use of their engines with advantage. See China Sea Directory, Vol. II.

SINGAPORE to the MOLUCCAS.—Full-powered steamships would probably find it shorter to take the route south of Borneo in both monsoons, but sailing vessels should proceed north or south of Borneo according to the monsoon.

North-east monsoon.—From October to May the north-east monsoon blows north of the equator, and the north-west monsoon south of it; at this season the passage should be through Carimata strait, east of Ontario reef; see China Sea Directory, Vol. I. On leaving the strait a vessel should steer to pass 10 miles south of Great Solombo island, and thence south of Taka Ramata, on which there is a *fixed* and *flashing white* light; then south of Mansfield bank, and through Salayar strait between Sarongtaug (Middle island) and Painatata (South island). Once clear of Salayar strait, Amboina and Banda are easily reached by passing south of Hegudis, Greenwood, and Binongka islands; but vessels bound for Pitt passage should round the south point of Buton, and skirt along the shore until they reach the east point, passing to the west of Wangi Wangi islands. They should then bear north for Wowoni island and thence run for the south point of Sula Besi. The currents in this locality set to the south, and are very strong. If drifted to leeward of the north point of Buru, vessels should pass to the southward and eastward of that island, through Manipa strait.

South-west monsoon.—From May to September the south-west monsoon blows north of the equator and the south-east monsoon

south of it. At this season a vessel should run south of the Anamba and Great Natuna islands, and then between the Royal Charlotte and Louisa shoals, taking care to avoid the dangerous shoals bordering the Borneo coast, and also the being set to leeward of Balambagan island by the northerly current which prevails in the south-west monsoon. Having made Balambagan island haul round its north point, and steer through Balábac strait, *see* Chap. IV., then through Sibutu passage or one of the passages of the Sulu archipelago, cross the Celebes sea for the north point of Celebes island, and then work south through Molucca passage.

SINGAPORE to NORTH COAST of AUSTRALIA.—**Steam-ships and sailing vessels** should proceed by Banka or Carimata strait to Sapudi strait; thence through Lombok or Alas strait and south of Timor to the Arafura sea. Steam-ships can, however, continue from Sapudi strait east along the parallel of 8° S. until north of Ombai strait, and between Wetta and Timor, and south of the Serwatti islands to port Darwin, or through the Arafura sea to Torres strait.

Some authors recommend for steam-ships the route from Carimata strait through Salayar strait, and when the peak of Kambaena bears N.W. to run S.E. by E. for Wetta passage, but this route is not taken by the Eastern and Australian steam-ships.*

During the south-east monsoon only steam-ships can make the passage from Singapore to Torres strait. The route then taken is from Sapudi strait along the parallel of 8° S. as above. Sailing vessels for the north coast of Australia should cross the China sea and go through Balábac strait, Sulu and Celebes seas, and Molucca passage (as described above) to the Moluccas.

NORTH COAST of AUSTRALIA to SINGAPORE.—**In the north-west monsoon** steam-ships pass south of the Serwatti islands, through Wetta passage and along the parallel of 8° S. to Sapudi strait; thence through Carimata or Banka strait to Singapore.

Sailing vessels should proceed to the northward through Arafura and Banda seas, Manipa strait, and Molucca or Gillolo channels, where they would have the advantage of fine weather; and when to the northward of Gillolo, the wind would probably be from the northward and eastward, thus enabling them to proceed round the north end of Borneo, and so with the north-east monsoon down the China sea to Singapore.

In the south-east monsoon steam-ships and sailing vessels pass through the Arafura sea south of Timor, and through Alas and Carimata strait as above.

* Navigation of the Pacific Ocean, China Sea, &c. United States Hydrographic Office, 1875, Chap. V.

COMMERCE. — Philippines. — The chief exports of the Philippines are sugar, hemp, tobacco, cigars, and copra. During the year 1899, according to the British consular report, the export of sugar amounted to only 93,000 tons, while in the previous year it was 152,000 tons; a large quantity of growing sugar was left to rot on the ground for want of men to harvest it. Hemp also greatly declined, from 99,000 tons in 1898 to 75,000 tons in 1899; many other articles also were similarly affected. The imports are chiefly cotton goods, petroleum, coal, rice, provisions, &c.

All industries suffered very severely from the late insurrection and war, and commercial enterprise has been so completely paralysed that recent statistics afford no useful guide to the potentialities of the near future. When peace and a settled form of government are well established, new enterprises will doubtless cause the future prosperity of the island to far exceed anything that has existed in the past.

Dutch colonies. — The chief exports are sugar, coffee, rice, indigo, cinchona, tobacco, and tin; with the exception of rice, about one-half of which is supplied for Borneo and China, nearly four-fifths of these exports go to the Netherlands. The chief and almost sole article of export to Great Britain is unrefined sugar.

Imports. — Cotton goods, mercers' wares, provisions, and coal.

The entire trade of the Dutch colonies referred to in this work, is carried on with Java, and none of it directly with either Europe, the United States, or Australia.

UNIFORM SYSTEM OF BUOYAGE. — Philippine islands. — All buoys that will be hereafter laid down in the Philippine archipelago will be painted in accordance with the system in the United States, and as soon as practicable the colours of the buoys now in place will also be changed, to conform to the system as follows:—

In approaching a channel from seaward, red buoys with even numbers will be found on the starboard side; buoys on the port hand being painted black with odd numbers on them.

Middle ground buoys will be painted with red and black horizontal stripes, and may be passed on either hand.

Mid-channel buoys will be painted with black and white vertical stripes, and must be passed close to in order to avoid danger.

Beacons on the *sides* of channels will be coloured like buoys.

Netherlands East Indies.—

1. The term *starboard* hand means that side which would be on the right hand going with the main stream of flood, or in entering a harbour, river, or estuary, from seaward; the term *port* hand means the left hand side, under the same circumstances.

2. Conical (nun) buoys are starboard hand buoys as thus defined, and are painted red.
3. Can (truncated) buoys are port hand buoys as thus defined, and are painted black.
4. Spherical buoys, as a rule, are placed at the partition of two fairways, or mark the ends of middle grounds, and are painted black and red in horizontal stripes; if additional buoys lie between those at the ends of shoals, they are painted in a similar manner. Spherical buoys are always surmounted by top marks, other buoys only in special cases.
5. Buoys lying outside, and marking the approach to seaward channels are of a special shape, and are painted red and black in vertical stripes.
6. The buoys marking the outer shoals remain as at present.
7. Wrecks are marked by *conical* or *can* buoys, painted green, according as the wreck lies on the starboard or port side of the fairway. Should the wreck be in mid-channel, it will be marked by a *can* buoy on one side, and a *conical* buoy on the other side, which buoys are to be treated as port or starboard-hand buoys according to shape.
8. The top marks are as follows:—
 - A diamond marks the outer or seaward side of a bank.
 - A cone marks the inner side of a bank.
 - A ball marks the starboard side of the fairway.
 - A truncated cone marks the port side of the fairway.
 - A cross is used as a special mark, and surmounting a *spherical* buoy indicates that the buoy may be passed on either side.
 - The ball and truncated cone are also used as top marks for beacons.
 - The top marks are of the same colour as the buoys or beacons on which they are placed.
9. The buoys of sea channels will be numbered consecutively (beginning from seaward), and marked by the first letter of the name of the channel. The numbers and letters will be white.

This uniform system of buoyage will gradually be adopted, as regards the shape of the buoys and top marks, whilst the alteration in colour will only be made when all else has been changed in accordance with the new system. For this reason, it is necessary during the period of transition, that attention should be exclusively given to the colour (as has hitherto been the case), and not to the shape of the buoys; the existing colours, black and white, remaining temporarily unaltered.

Light-vessels.—The Netherlands light-vessels show an anchor light in addition to the distinguishing light.

CHAPTER II.

WEST COASTS OF LUZON AND MINDORO ISLANDS; MINDORO STRAIT; KALAMIANES ISLANDS; SULU SEA; CUYOS AND KAGAYAN ISLANDS; BASILAN STRAIT.

VARIATION IN 1902.

Manila - - 0° 50' E. | Basilan strait - 0° 20' E.

LUZON.—Luzon is the largest island of the Philippines, and, after Java, the most fertile and populous of the whole Malay Archipelago. It extends from north to south, with a curve towards the south-east, between the parallels of 18° 40' and 12° 32' N., and has a length of about 470 miles, with a width varying from 6 to 120 miles. It has a very irregular outline, and its area is about 47,200 square miles. A range of mountains, known as the Caraballos, runs through the whole of it, branching out in different directions so as to give the whole island a mountainous character. To the north of latitude 16° N. there are two chains, an eastern and a western; the former, known as the Sierra Madre, being the most continuous and lofty. The mountains are generally higher near the eastern side, where they form a bold and almost inaccessible shore, exposed to the full force of the north-eastern monsoon, and the waves of the Pacific.

Population.—The population of Luzon was estimated by the Philippine Commissioners in 1899 to be about 3,900,000.

The north coast of Luzon, from cape Bojeador eastward, is described in Chapter IX.

WEST COAST.—CAPE BOJEADOR, the north-western extreme of Luzon is about 300 feet in height, sloping down to its farthest point; it is surrounded by a reef which extends about 1½ miles seaward and north-eastward of it, and to the southward beyond Dirikwi creek. The reef off this cape was struck by the s.s. *Centennial* when about 2 miles west of the lighthouse, the least depth obtained being 16 feet. Vessels should give this cape a good berth.

LIGHT.—From a truncated brick pyramid with white cupola, 65 feet in height, erected on a hill nearly a mile eastward of the extreme of the cape, is exhibited at an elevation of 360 feet above high water a *flashing*

See chart, No. 2,454 [2,670].

white light with a period of *one minute*, the duration of the *flash* being *fifteen seconds*. The light is visible seaward between the bearings N. 14° E. and S. 56° W., from a distance of 26 miles in clear weather.

Current.—During the north-east monsoon a current of $1\frac{1}{2}$ knots an hour has been observed setting to the northward in the vicinity of cape Bojeador.

The coast to the southward of cape Bojeador is clifty and fringed by a reef for about 5 miles; thence to mount Kaut, 17 miles south of the cape, it is low with a sandy shore, the country in the interior being very high. Temporary anchorage will be found along this coast during the north-east monsoon. Regular soundings decreasing from 13 to 7 fathoms exist in the bight from Cape Bojeador to Laoag river.

The chain of high mountains, which commences near St. Fabian in the gulf of Lingayen, extends parallel to the coast, gradually diminishing in height,; and, stretching more inland about 24 miles to the southward of cape Bojeador, leaves a spacious plain fronting the sea. Another chain of hills begins about 7 or 8 miles from the shore, and stretches northward parallel to the coast line.

Dirikwi creek.—During the north-east monsoon good anchorage can be obtained off Dirikwi creek in a depth of 12 to 15 fathoms, sand, with cape Bojeador lighthouse bearing N.N.E.; or inside, in 6 to 10 fathoms, where there is shelter except from the south-west, and swinging room for a vessel 250 feet in length. The points on both sides are fringed with coral reefs that dry out a considerable distance at low water, but the entrance is clear with 11 to 14 fathoms, shoaling gradually to the sandy beach at the head of the bight.

Mount Kaut, a sand hill 300 to 400 feet high, partially covered with bushes, forms a conspicuous mark on this low coast. Laoag river enters the sea close southward of the mount, off the mouth of which the *Yorktown* anchored (1901) in a depth of 7 fathoms where a shallow bank formerly existed. The anchorage should be approached cautiously, as the depths decrease rapidly from 10 to 5 fathoms. The town of Laoag is about 5 miles up the river.

The coast from mount Kaut trends S.S.W. for 8 miles to Kulili point, which is a conspicuous bold bluff connected with the mainland by a low sand strip; thence the coast line continues S. by W. for 10 miles to Solot point, off which lies Badok island. Midway between Kulili point and Badok island is Gan bay, with reefs extending $1\frac{1}{2}$ miles to seaward. Immediately north of Gan bay is port Kurrimao, a cove open to the south-west, with a depth of 4 fathoms, sand.

Badok island is a table-land of bold outline moderately high and almost bare of trees, but there is one small clump near the centre of the

island. It is surrounded by a reef, and lies three-quarters of a mile from Solot point. Between Badok and the mainland there is a passage half a mile broad, with a least depth of about 6 fathoms in it.

The coast intervening between Badok and Salomague island, 7 miles to the southward, is rocky, and a reef extends nearly a mile off shore between Sinait and Kabugao. Off Kabugao river there is anchorage in a depth of 6 to 7 fathoms, sand.

Salomague island, of moderate height and thickly wooded, lies about half a mile off the mainland; with a reef extending a cable south-west of it.

Shoals.—A shoal, with one fathom water, lies $2\frac{1}{2}$ miles N.E. $\frac{1}{2}$ N. from Salomague island; a rocky bank with 7 to 8 fathoms, lies 4 miles north of the island.

PORT SALOMAGUE lies on the mainland south-eastward of Salomague island, and is, though open to westerly winds, an important place during the south-west monsoon, when landing at Vigan is generally impracticable. The north point is surrounded with a reef which extends southward from it for $3\frac{1}{2}$ cables, and continues eastward, fringing the whole of the port to the distance of about one cable. The south point of land which separates this port from Lapog bay is also fringed by a reef which projects 3 or 4 cables to the westward.

Shoals.—A shoal is reported to lie near the centre of port Salomague, about three-quarters of a mile north-eastward of the south point. Two other shoals close together, with a depth of 3 feet, lie $1\frac{1}{2}$ miles W.S.W. of the same point, which is steep-to and may generally be seen in clear weather. There is also a patch of $2\frac{1}{2}$ fathoms between these shoals and Salomague island.

Directions.—Port Salomague may sometimes be known from the offing by a gap in the mountains that overtop the rest of the chain within this coast, which when steered for bearing East leads to the south end of Salomague island. This gap is said to somewhat resemble the gap of Vigan, but is not so large; it is difficult to distinguish, and does not approach so near the sea as that gap. Pass close southward of the reef extending south from Salomague island and to avoid the $2\frac{1}{2}$ -fathoms patch further south, and thence midway between the points of the port, rather inclining towards the northern shore, and anchor in $7\frac{1}{2}$ fathoms. Farther in, towards the south-east part of the port there is a shoal spot, which will be perceived in clear weather by the discoloured water on it. The best berth is in about $7\frac{1}{2}$ fathoms, sand and mud, with the tower on the north shore of the port bearing north, distant $3\frac{1}{2}$ cables.

Coasting steamers call here monthly.

Lapog bay, immediately to the southward of port Salomague, is sheltered from all winds except those between S.W. and W.N.W.; and

See chart, No. 2,454 [2,670].

has depths of 5 to 7 fathoms, sand, until near the shore. The north side of the bay is fringed by a reef, and there is a shoal in the centre of the bay about one mile off shore. The 3-foot shoals before mentioned lie in its approach. The position of the bay will be recognised by mount Bulagao, 3,629 feet high, situated to the south-east.

Pinget island is low, covered with trees, and situated nearly a mile off shore, to which it is apparently connected by a sand ridge, with anchorage for small craft on the south side of the ridge. The island (difficult to distinguish from the mainland) has sandy shores, and is surrounded by a reef, which is steep to on the western side. During the S.W. monsoon good anchorage may be had eastward of the north point of Pinget island, in a depth of 10 fathoms, mud, or farther southward in 4 to 8 fathoms, sand. A shoal lies about a mile southward of Pinget island, and the same distance off shore. From abreast of the island the coast is low and sandy to point Dile, a distance of 7 miles.

POINT DILE, in lat. $17^{\circ} 34' N.$, is low, but is the most prominent point of this part of the coast; Bulagao mountain, 3,629 feet in height, situated 11 miles E.N.E. from the point, is the most conspicuous landmark of this neighbourhood, showing two rounded peaks when seen from the southward. The mouth of the river Abra entering the sea at Dile point is nearly closed; the mouth now lies south-west from the town of Santa.

Markedly discoloured water, extending 6 to 8 miles seaward, has been observed off Dile point, probably the discharge from the Abra river.

Telegraph.—There is a telegraph station at Dile point.

Current.—Between Badok island and Dile point during the north-east monsoon, a current of $1\frac{1}{2}$ knots an hour has been observed setting to the northward.

Vigan road, south-eastward of Dile point, is sheltered from northerly winds by that point, but exposed to the southward and westward. A patch of $3\frac{1}{2}$ fathoms lies about $1\frac{1}{2}$ miles off shore at 3 miles southward of the point. The anchorage is in 8 to 12 fathoms, near the shore, with the southern mouth of the Abra river bearing about East: the bank shelves suddenly. About 9 miles inland E.N.E. of the road there is a gap between two mountains, named Abra de Vigan, which is very conspicuous when viewed from the offing, and is a good mark by which to recognise this part of the coast. The town of Vigan is situated about $2\frac{1}{2}$ miles north-east of the anchorage, on an eminence.

Directions.—Steer in for Vigan road with the middle of Vigan gap bearing E.N.E. until the roof of a long, low, detached building, seen among the trees some distance to the right of the village on the beach, bears N.N.E. $\frac{1}{4}$ E., when steer for the latter. (The building itself is

See chart, No. 2,454 [2,670].

hidden by trees but the roof is conspicuous.). Proceed slowly as the water shoals suddenly, and anchor in from 8 to 10 fathoms, mud, with the extreme of Dile point bearing N.W. by N.

Solbek bay lies 10 miles south-eastward from Dile point. The eastern shore of the bay is encircled by a reef which extends out a considerable distance; the western point also has a similar reef. Small vessels can anchor in front of the town sheltered from all except south-west winds. Agayayos point is conspicuous, and the sharply-defined Tetas de Santa, 1,407 feet high, are easily distinguished.

San Estevan and Santiago.—At $6\frac{1}{2}$ miles southward of Solbek bay is the small port of San Estevan, $1\frac{1}{2}$ cables in width and available for small craft, but open to the northward. Anchorage may be had off the entrance in a depth of 10 fathoms, at the distance of $1\frac{1}{2}$ cables from the shore reef. Off the north point of the port lies Darigayos bank extending about 4 cables to the westward, upon which the least depth is 3 fathoms.

At the distance of $2\frac{1}{2}$ miles beyond San Estevan is the small port of Santiago, one cable wide.

Kandon point is low, fringed by a reef and covered with cocoanut trees. Anchorage is good to the southward of the point during the N.E. monsoon. A patch of $2\frac{1}{2}$ fathoms lies about half a mile off Kaloang, 2 miles southward of the point. The land in the vicinity of Kandon point is high, terminating to the north, at San Estevan point, in a cliff.

Telegraph.—There is a telegraph station at Kandon.

The coast from Kandon point trends south 19 miles to the entrance of Amburayan river, then 7 miles south-westward to Darigayos point, which is low, covered with trees, and surrounded by a reef; thence it trends southward again for 13 miles to San Fernando point. Santa Lucia is the most conspicuous town along the coast, and may be known by its church with a large white dome. Namagpakan, which also shows plainly, has a church with three towers. The town of Darigayos can be distinguished from the southward by the white roof of its church showing. San Juan may be recognised by the church tower, near which is a belfry painted red.

Caution.—During the north-east monsoon a strong current has sometimes been experienced, setting to the northward, along this coast. It and the coast northward as far as Dile point should be given a berth of about 3 miles, as it has not been examined. The Spanish sailing directions state there is a bank with one fathom least water, and 2 miles in extent, between San Estevan point and Solbek, but it is not shown on their charts.

See chart, No. 2,454 [2,670].

PORT SAN FERNANDO.—San Fernando point is the north-west extreme of a low peninsula about $1\frac{1}{2}$ miles in length connected with the main by a narrow isthmus; it rises to about 100 feet on its southern side and slopes to the northward, and makes a good landmark. The peninsula forms, with the adjacent coast, two small anchorages; in the southern, there is a depth of 6 fathoms rocky bottom; the northern is the port of San Fernando, where anchorage can be obtained in 4 to 9 fathoms, fine sand, but it is exposed to winds from the northward, when the southern anchorage affords shelter. The north and east sides of the peninsula are fronted by reef to the distance of 4 cables, with depths of less than 3 fathoms at three-quarters of a mile north-east of the light-house; the south point of the peninsula is also foul to the distance of a quarter of a mile. There is also a detached coral shoal of $2\frac{1}{2}$ fathoms situated with San Fernando point light bearing N. 1° W., distant $2\frac{1}{2}$ miles.

The town of San Fernando is situated on the east side of the port on high land, and maintains frequent communication with Manila.

Supplies.—Game and fish are procurable. Water is obtained from wells.

Telegraph.—San Fernando is a telegraph station.

Typhoon signals will be shown day or night when occasion requires at San Fernando, from a mast 80 feet high standing 83 yards eastward of the wharf. These signals can be seen with glasses from outside the reef. For details of signals, *see* page 67.

LIGHTS.—A *fixed white* light, elevated 29 feet above high water, is exhibited from an iron support on San Fernando point, south side of the entrance to the port, visible in clear weather from a distance of 10 miles.

At San Fernando town two *fixed red* lights, 19 feet and 106 feet respectively above high water and 590 yards apart, are shown from white poles, which in line bearing S. 36° E. lead into the bay. When San Fernando point light is abeam steer S.S.E. for the anchorage.

A *fixed green* light is shown at the end of San Fernando pier.

Fagg reef, composed of sand and rock, one cable in extent, with a least depth of $4\frac{1}{2}$ fathoms, lies 2 miles N.W. $\frac{1}{2}$ W. of San Fernando point lighthouse. This reef is sometimes marked by breakers.

Rocky shoal.—A small coral patch, of $6\frac{1}{2}$ fathoms, steep-to, lies W. $\frac{1}{2}$ S. distant 10 miles from the north extreme of San Fernando point.

A reef that breaks extends from the coast about 2 miles to the southward of San Fernando peninsula.

LINGAYEN GULF is about 30 miles in length, and about 20 miles in breadth at the entrance, between Santiago island and San Fernando point; on the east coast are the lofty mountains of Ilocos, with the mount of St. Thomas, 7,418 feet high. About $3\frac{1}{2}$ miles southward of Fernando point there is a prominent brown bluff; the white roof of

Bauang church shows clearly, otherwise the villages along the eastern shore are not conspicuous. A series of sharply serrated peaks running from Rabon river to Toko forms a conspicuous landmark.

The west coast of the gulf is of moderate height and tolerably level, gradually rising southward to a compact mountain mass. From the island of Santiago, for 12 miles to the south-eastward, the west shore is fringed by an almost continuous chain of islands which are, as a rule, low and wooded, with shallow channels between them available for coasters.

Winds.—The prevailing wind during the greater part of the year is from S.E. During the north-east monsoon, land and sea breezes become regular, and blow freshly, with clear atmosphere, but are interrupted by strong north and north-easterly gales; a bank of cloud seen in the north, with a clear sky and high barometer, is a certain sign of the commencement of a gale. In June, the wind blows from S.E. in the morning, with squalls off St. Thomas and San Isidro mounts; towards the evening, it dies away with heavy rain and thunder, and clearing towards midnight leaves a light wind from the south, which sets in from the S.E. with the dawn. From July to October there are usually gales from the S.W. and west, lasting for several days, accompanied by torrents of rain.

The worst period in the gulf is from the middle of September until the end of October, when typhoons occur.

Port St. Thomas lies within a shoal with depths of one to 5 fathoms, which extends about 4 miles southward of the point forming its west side. If intending to proceed to this port, St. Thomas mount should be brought to bear N.E., or northward of that bearing, which leads southward of the shoal; steer for the mount as stated, until the depths decrease to 6 and 7 fathoms, then haul northward for the anchorage.

There is said to be a passage across the shoal with a depth of 16 feet between the point and the head of the shoal.

To the north of port St. Thomas the shore of the gulf is high and steep-to.

The coast.—From St. Thomas the coast, trending to the southward, is high and mountainous as far as the town of San Fabian, situated northward of the mouths of two streams; thence the coast line continues 3 miles south-westward to Binlok river.

Dagupan or Sinokalan river, 3 miles south-westward of Binlok river, is an arm of the river Agno; the bar at its mouth shifts frequently, but 6 feet can generally be carried over it. There is no difficulty after the bar is passed, but the west bank should be kept, and a sunken wreck must be avoided when going alongside the wharf at Dagupan situated a short distance within the mouth.

Pilots can be obtained by signal whistle from the village at the entrance. The pilots keep the bar channel buoyed out, shifting the buoys as may be necessary. The buoys are bamboo poles with a feathery palm leaf at their head, and should be left close on the starboard hand in entering the river.

LIGHT.—A *fixed red* light, elevated 29 feet above high water, is exhibited from a white iron support on the north-east side of Dagupan river entrance, visible in clear weather from a distance of 5 miles.

Anchorage can be obtained off Dagupan river in a depth of 6 fathoms, sand, with Dagupan lighthouse bearing S.E. and Lingayen church S.W. $\frac{3}{4}$ W.

Telegraph.—Railway.—There is a railway from Dagupan to Manila, and telegraph communication with the principal towns of Luzon.

LINGAYEN; the chief town of the province of Panga Sinan, is situated on the island in the delta of the Rio Agno between the Dagupan mouth and its western mouth, small craft reaching it by the former. The tower of the church of Lingayen is visible for many miles and forms a good landmark. The population of the town is about 20,000; of the province, 304,000.

Climate.—Products.—The climate is humid, although healthy for the natives, and the sea breeze blows over the town. The land is low and fertile, and produces rice, maize, indigo, cotton, and nipa wine. Horses, cattle, and buffalo are raised. Fish, fruit, and vegetables are procurable; water is obtained from the wells, as the river is brackish. Small craft are built here.

RIO AGNO.—The Coast.—The land forming the head of Lingayen gulf, eastward of port Sual, is very low, with several rivers discharging through it. Rio Agno, 3 miles eastward of port Sual, has 6 feet on its bar at high water springs, and there is anchorage in a depth of 4 to 5 fathoms, sand, off it. Three perches mark the western side of the entrance channel, but they are not to be depended on. Small craft can ascend the river about 2 miles.

The town of San Isidro, with 2,700 inhabitants, is situated on the west bank of this river. Mount San Isidro, a conical mountain covered with trees and 2,352 feet in height, lies south-west of the town.

PORT SUAL, situated at the south-west head of the gulf, has good anchorage, with muddy bottom, at its entrance.

The port is a little over a mile in length north and south, and 7 cables in breadth, with depths of 4 to 8 fathoms; the entrance, however, is narrowed by rocks and reefs which extend 2 cables from Portuguese and Mangas points on either side to a breadth of about 3 cables, while a coral bank, with from one to 3 fathoms water, extends half a mile from the west

shore filling up a large portion of the port. There are reported to be several rocky heads in the northern part of the port. (The plan of it must be used with caution.)

Port Sual is of considerable value, being the only secure harbour of refuge in all weather, besides Olongapó, between Manila and cape Engaño.

Buoys.—The north-east and south-east points of the shoal in the centre of the port, and the south end of the shoal projecting from Portuguese point, are marked by bamboo poles; their existence should not be depended upon.

Adela rock or bank, about $1\frac{1}{2}$ cables in extent with 2 fathoms least water, and steep-to, lies in the approach to port Sual, with Portuguese point lighthouse bearing N.W. $\frac{1}{4}$ N. distant $8\frac{1}{2}$ cables. It is in reality a sandspit extending about 7 cables from Mangas point.

Settlements.—In the south-west part of the port is the village of Sual, which has a church and a landing jetty. The population in 1880 numbered 3,000. There are several small villages and a landing jetty in the northern part of the port; both jetties were in a bad state of repair in 1897, and one of them is said to have been recently destroyed.

Tides.—It is high water, full and change, at port Sual, at about 8h.; springs rise 6 feet.

LIGHT.—From a white iron tower, 20 feet high, erected on Portuguese point, at the entrance to port Sual, a *fixed red* light is exhibited, at an elevation of 79 feet above high water, visible seaward between the bearings of S. 10° E. and N. 49° E. from a distance of 10 miles in clear weather.

No light was being exhibited, August 1900, on account of a defective lens.

Supplies.—Coal which is brought from Lingayen to Sual, water, and small supplies of provisions are obtainable.

A British vice-consul resides at Sual, and there is frequent communication with Manila by steam vessels, and by railway from Dagupan.

Directions.—Approaching port Sual from the northward, give the islands on the west side of the gulf a berth of 3 or 4 miles. Mount San Isidro is a good mark for identifying the port, and also Portuguese point lighthouse and the church on a near approach. Pass about a cable north of the dry reef off Mangas point with the church bearing W. $\frac{1}{4}$ S., which mark will lead clear to the anchorage in $4\frac{1}{2}$ to 5 fathoms, at the distance of about 6 cables from the church.

The bottom at the anchorage consists of hard to soft coral. Owing to the wind blowing in flaws, vessels are very liable to foul their anchors.

See chart, No. 2,454 [2,670], with plan of Port Sual.

Kabarruyan island, the south-eastern of the large islands on the west side of the gulf, is 6 miles in length north and south, moderately high, and covered with trees. These islands are fronted by reefs to the distance of about $2\frac{1}{2}$ miles.

From Kabarruyan the coast trends south-eastward to port Sual, is intersected by bays with sandy shores, and has many islets off it.

The Hundred isles, or *Mongos Mongos*, form a portion of the above mentioned islets. *Komas* and *Kabalitian* islands lie near the shore between the Hundred isles and Sual, the former being connected with the shore by a reef dry in places.

PORT BOLINAO is the indentation in the coast at the north-east extreme of Cape Bolinao, its eastern side being formed and protected by Santiago island. The port is but 3 cables wide with a depth of 10 fathoms and is open to northerly winds, but small vessels can proceed to the inner anchorage, eastward of the south-west point of Santiago island, which is reported to be one of the best typhoon shelters in northern Luzon.

The entrance is about a quarter of a mile wide between the 5-fathoms lines, with a depth of 8 to 10 fathoms. A patch of 2 fathoms appears on the plan at $4\frac{1}{2}$ cables N. $\frac{1}{4}$ E. from the west point of entrance.

Directions.—The south-west point of Santiago bearing S.S.E., leads between the 2-fathoms patch at the entrance and the reefs westward of Silakwi and Santiago islands, which show, except in calm weather; after passing the western entrance point, keep in mid-channel to the anchorage eastward of the south-west point of Santiago island.

Off-lying islands.—**Santiago island** is about 4 miles in length, about 2 miles in breadth, and protects Bolinao port from easterly winds. It is comparatively low, covered with trees, and terminates in a bluff at its north extreme; its highest portion is visible about 18 miles.

A coral reef extends northward and eastward from Santiago for a distance of $2\frac{1}{2}$ miles; Silakwi islet stands upon its northern edge.

Silakwi islet, situated about 3 miles north-north-east of port Bolinao, appears wedge-shaped when seen from the westward; between it and Santiago island are several small rocky islets.

Shoals.—A shoal with 8 fathoms lies 4 miles N.E. of Silakwi islet, and another with 7 fathoms lies $6\frac{1}{2}$ miles N.E. by E. $\frac{1}{4}$ E. of the islet. There is also a shoal, about 4 miles in extent in a north and south direction, the depths on which vary from $5\frac{1}{2}$ to 20 fathoms, situated with its southern part N.N.E. $\frac{1}{2}$ E. from Silakwi islet, distant about 4 miles.

Vessels are recommended on rounding Silakwi island to give it a berth of at least 8 miles. Sailing vessels should especially give these islands a good berth in the north-east monsoon, to guard against any southerly drift that may be prevailing.

CAPE BOLINAO is the northern end of the peninsula which forms the western shore of Lingayen gulf. It is of moderate height, thickly wooded, slopes gently towards the sea, and may be seen in clear weather at the distance of about 24 miles.

Piedras point, the north-west extremity of the peninsula, is moderately high, steep-to, and sterile in appearance. From Piedras point, the coast, fringed with shoals and reefs, trends north-eastward for 7 miles to cape Balinhasay, near which stands the town of Bolinao.

Semaphore.—There is a semaphore on Piedras point connected with the telegraph system of Luzon.

The coast from Piedras point to Caiman point is level, of moderate height, and sterile aspect, with a steep beach fronting the sea; it may be seen in clear weather from a distance of about 24 miles. At a mile distant the depths are about 50 fathoms, but near the coast sunken rocks exist in places. Agno-Grande, a circular bay 14 miles southward of Piedras point, affords shelter for small craft from north-east winds, off the mouth of the river in 6 to 8 fathoms, with the north point of the bay bearing N.W. Agno point is said to be foul for a considerable distance, and should be given a berth of about 3 miles; Tambobo point, 7 miles southward, is bordered by rocks; Caiman point lies 5 miles further to the south-south-east, and has a reef projecting southward a short distance. The coast between Caiman point, and Palauig point, 30 miles southward, is indented with several bays encumbered with reefs which project beyond their entrance points.

DASOL BAY lies between Caiman and Santa Cruz points, within a chain of islands and reefs; there are several shoals situated about $1\frac{1}{2}$ miles from the main shore. The bottom generally is rocky and shoals in a dangerously irregular way. The bay should only be entered by daylight and then with extreme caution.

Adder or Culebra island, about $1\frac{1}{2}$ miles south of Caiman point, and 5 miles northward of Hermana Mayor, is small, has trees on it and a sandy beach. It is encircled by a reef which extends some distance northward, and for about half a mile or more from its southern side.

Hermana islands, or the Sisters, 3 miles apart, are low and wooded, with conspicuous sandy beaches. Hermana Mayor is surrounded by a narrow reef; a bank with a depth of 5 fathoms, extends $1\frac{1}{4}$ miles westward from its south point. North of the island lies a reef about 4 miles in length N. by W. $\frac{1}{2}$ W. and S. by E. $\frac{1}{4}$ E., with rocks above water; between it and Hermana Mayor there is a channel with a depth of $4\frac{1}{2}$ fathoms. Between the above reef and Adder or Culebra island, there is apparently a channel with 11 fathoms water. Hermana Menor, or Makalira the southernmost island, lies off Santa Cruz point, the channel between

having 8 fathoms water in it; the island is about one mile in diameter, encircled by a narrow reef, and there is a patch of $2\frac{1}{2}$ fathoms about a mile off its north-west side.

Tambove road is the name of the north-east head of Dasol bay; it is open to southerly winds, has a depth of 18 fathoms in the entrance and 6 to 13 fathoms at the anchorage.

The west shore of Tambove road is foul, and should not be approached within the distance of one mile. The eastern shore is also foul.

A reef is charted as lying about $1\frac{1}{2}$ miles off Tanglao river, and there is a smaller one at $1\frac{1}{2}$ miles northward of it, with 6 feet water.

Directions.—The best approach to Tambove road is between Adder island and Caiman point reefs, which passage is deep and one mile wide, and presents no difficulty. Vessels should keep to the northward of mid-channel as the reef extends some distance from Adder island. When within Caiman point steer to give a berth to reefs extending off the next point eastward, which is said to be charted too far to the southward; when the road or bay is well open steer to the northward for Dauli point, but until in soft mud it will be inadvisable to anchor, for rocks are scattered over the bottom where it consists of sand.

Wood and good water may be obtained here.

Santa Cruz, at the southern end of Dasol bay, is a telegraph station. The port is used by coasters, who, coming from the northward, enter by the passage between Caiman point and Culebra as if bound for Tambove road, thence between Hermana Mayor and Raton islet. From the westward, pass midway between the two Hermanas and steer for a prominent white scar on a low range of thickly wooded hills, 3 miles inland, bearing E. $\frac{3}{4}$ S., which will lead between a black buoy on the port hand and a red buoy on the starboard. Anchor in 4 fathoms, half a mile from the beach.

Raton islet stands on the reef situated about a mile off the point near the mouth of Nayun river northward of Santa Cruz; and there is a reef about one mile northward of it.

The coast from Santa Cruz point, which is low and covered by mangroves, to Bani point, low, sandy, and with patches of mangroves, a distance of 11 miles, is fronted by reefs extending 5 miles off. At $6\frac{1}{2}$ miles to the southward of Santa Cruz point is Arenas point, of dark coloured sand, with a bay lying between, into which three rivers discharge.

Sabalay bank, 3 miles in length north and south, and 2 miles in breadth, lies $1\frac{1}{2}$ miles north-westward of Arenas point; it has a reef awash at its eastern edge, with general depths of $1\frac{1}{2}$ to 5 fathoms over a rocky bottom. Between Sabalay bank and Arenas point are several pinnacles, with depths of $2\frac{3}{4}$ to 4 fathoms.

Tortuga bank, about 3 miles southward of the rock awash on Sabalay bank, is 2 miles in extent east and west, with a least depth of $2\frac{3}{4}$ fathoms.

PORTS MASINLOK AND MATALVI, situated between Bani point and Makalaba island, are separated by Pulo San Salvador and the reef which extends eastward of it.

Pulo San Salvador is of moderate elevation, thickly wooded, and has reefs extending from a half to three-quarters of a mile off its west and north-west sides. The channel south of the island is about $3\frac{1}{2}$ cables wide in its narrowest part, has a depth of 15 to 20 fathoms, and leads to port Matalvi.

Port Masinlok.—The channel between Pulo San Salvador and the reef extending nearly a mile southward of Bani point is $1\frac{1}{4}$ miles wide, but it is encumbered by many isolated shallow patches which reduce the navigable channel between them and the island to a breadth of 4 cables, in which there are depths apparently of 14 to 20 fathoms. There is a circular reef within them about a mile in diameter, and the shore is fronted by a reef, steep-to, to the distance of about half a mile.

The south-eastern part of port Masinlok is greatly obstructed by an extensive tongue of coral and sand, which projects out in a W.S.W. direction for a distance of 11 cables from the village of Masinlok; the bank is about $3\frac{1}{2}$ cables broad, and upon it the depths are 3 fathoms, decreasing to half a fathom in the middle part of the tongue.

The anchorage is northward of the tongue in a depth of 11 fathoms, mud, with the centre of the village bearing E. by S. $\frac{1}{2}$ S., distant three-quarters of a mile; it is open to the north-west.

The village of Masinlok has about 6,300 inhabitants; the principal trade is in charcoal made from the forest in the vicinity.

Oyon bay, the northern arm of the port, apparently affords sheltered anchorage in about 8 fathoms, mud, being protected by the large circular reef in its entrance; this reef has a passage on either side of it about 2 cables wide, with depths of 4 to 8 fathoms. It would be difficult of access unless the reefs are easily seen.

Port Matalvi, between Matalvi island and the coast southward, affords complete shelter; it extends 2 miles east and west, and has a mean breadth of half a mile. The best anchorage is in 8 to 10 fathoms, mud, in the middle of the port. The space south-east of Pulo San Salvador is foul and strewn with rocks, but anchorage can be obtained in a bay on the east side of the island, in 5 to 6 fathoms, protected from northerly winds. Water can be obtained from a spring south of Luan island. Makalaba island, at the entrance of the channel leading to port Matalvi, is circular in form, with a sandy shore on its east side; reefs extend about three-quarters of a

mile from its north and south points. The island is connected by a sunken reef, with the reef forming the west side of entrance to the port.

The coast from Matalvi port trends southward to Palauig bay, and is low, sandy, and bordered by reefs. From Palauig point a coral reef fronts the shore to Iba point, 7 miles south-eastward.

Palauig point and bay.—Palauig point is bordered northward by small islets and rocky shoals, extending $1\frac{1}{2}$ miles. Between Palauig and Matalvi points is Palauig bay, $2\frac{3}{4}$ miles wide, and open to the north-west; the town of Palauig is situated on its south shore.

Palauig reefs consist of several patches situated from one to $4\frac{1}{2}$ miles off shore between Palauig and Iba points. The northern and largest reef, with but little water over it, lies $1\frac{1}{2}$ miles off Palauig point, the southern reef, Kinabakbagan, with $1\frac{1}{2}$ fathoms water, is $1\frac{1}{4}$ miles in extent; between these two there are several shallow patches, the outer one having $2\frac{1}{2}$ fathoms on it. It will be prudent to give these dangers a wide berth.

Iba point, lying 6 miles northward of Botolan point, is fronted by a coral reef. South-east of Iba point is the town of Iba, situated $2\frac{1}{2}$ miles from the mouth of the river of the same name.

Anchorage.—There is good anchorage both above and below the $1\frac{1}{2}$ -fathoms shoal which fronts the mouth of this river in a depth of 7 to 10 fathoms.

There is a small boat landing just south of Iba point, from which a fairly good road leads to the town, which is about one mile inland and is mostly hidden by trees.

Telegraph.—Iba is a telegraph station.

Shoal.—A shoal, with an estimated depth of $3\frac{1}{2}$ fathoms, and steep-to, lies about 4 miles from the shore in the approach to Iba, situated with Iba mount bearing N. 72° E., distant about $13\frac{1}{2}$ miles, and High peak N. 45° E. (Iba mount is said to be difficult to identify, and is not a good landmark.)

Botolan or Guai point, 6 miles south-south-east of Iba point, is surrounded by a reef to the distance of 3 cables; it lies at the northern extreme of the extensive plain of Playa Honda. Mount Botolan, 1,847 feet high, formed by two hills, is situated 2 miles within the point. About 17 miles inland is a range of mountains extending north and south; mount Pinalobo, in this range, reaches a height of 6,040 feet.

Shoals.—At $5\frac{1}{2}$ miles south of Botolan point, and 2 miles from the coast, is a pinnacle rock with $4\frac{1}{2}$ fathoms on it, and at 9 miles and $11\frac{1}{2}$ miles S. $\frac{1}{2}$ W. of the same point are two banks, each with 9 fathoms over them.

See plan, No. 945 [2,672], and chart, No. 2,454 [2,670].

The coast from Botolan or Guai point trends generally about S. by E. for 21 miles to Kapones point. Baranca Colorada, nearly midway between them, is a slightly salient point formed by a flat-topped hill situated on the sandy plain; the town of Kabangan is situated near the coast 5 miles to the southward.

Between Botolan point and Baranca Colorada, shallow water extends in places to the distance of 5 cables from the shore.

KAPONES POINT AND ISLANDS.—Kapones point, in lat. $14^{\circ} 54' N.$, is the most western point of this part of Luzon, and therefore of some importance to vessels proceeding to and from China, and passing near this coast. It is high, bare land, of reddish aspect, having three islands off it.

Great Kapones, the largest of the islands, lies $2\frac{1}{4}$ miles W.N.W. from Kapones point, is 8 cables in length, with rocks around. It is a conspicuous mark when made from either the northward or southward; its eastern part is the highest, and is sighted before the lighthouse on the western end becomes visible. The other two islands lie nearly midway between it and the coast.

Depths of 35 to 40 fathoms will be found within a mile of Kapones point. There is a patch of 6 fathoms 2 miles off shore at 3 miles northward of Kapones point.

LIGHT.—From a square brick lighthouse, 53 feet in height, erected 328 yards from the west point of Great Kapones, is exhibited at an elevation of 228 feet above high water a *white flashing* light every *half minute*, visible seaward, between the bearings of $S. 62^{\circ} W.$ and $N. 64^{\circ} W.$, from a distance of 22 miles in clear weather. Total eclipses intervene between flashes of about *nine seconds* duration. Reported irregular in 1894 and 1900.

The coast from Kapones point trends southward 8 miles to port Silanguin; it is high, rocky, has three small bays fronted by islets, and is backed by mountains which terminate northward in an extensive plain.

PORT SILANGUIN is about three-quarters of a mile wide at its entrance, 2 miles in length east and west, having tolerable shelter from all winds, except those from west to S.W. The southern point is formed by a round bare island, 482 feet in height, joined to the south point of the port by a reef of rocks. The depth in the entrance of the port is 30 fathoms, decreasing gradually to 10 fathoms, which depth will be found close to the shore reefs. The best berth is in from 17 to 20 fathoms, abreast the bench within the south point.

Sunken rocks extend about a quarter of a mile westward of the north point of the bay situated north-east of the east end of the island, and there is a patch which dries the same distance off the point within.

See chart. No. 2,577 [2,656], and plan, No. 931 [2,669].

From a half to $1\frac{1}{2}$ miles south-west of Silanguin island are the Los Frailes islets, with sunken and other rocks around and between them; beyond the depth of 5 fathoms they are apparently steep-to. Rocks have been reported to extend one to $1\frac{1}{2}$ miles westward of these islands.

Water.—There are streams of fresh water at the head of port Silanguin.

The coast between port Silanguin and port Súbic is high and moderately steep-to.

PORT SÚBIC or SÚBIG is 6 miles in length by 5 miles in maximum breadth, and $2\frac{1}{2}$ miles wide in its entrance, where Grande island divides it into two channels. The eastern entrance has probably not more than $4\frac{1}{2}$ fathoms in it, and is intricate. The western entrance is one mile wide, with depths of 30 to 34 fathoms.

This port forms two excellent harbours, one on the east side, named port Olongapo, and the other at the northern extremity, opposite the town of Súbic; here vessels may find anchorage sheltered from all winds, in a depth of 7 to 10 fathoms, mud.

Islands and reefs.—**Grande island**, in the entrance, 167 feet in height, is about half a mile in length and from one to 3 cables in breadth. A reef extends half a mile southward of it, on which is an islet. The channel, nearly a mile wide between Grande island and the eastern shore, is reduced to less than one-third by the reefs extending from both shores. [*Light proposed, and the building for it in progress.*]

Mayanga island lies in the fairway of the bay about $3\frac{1}{2}$ miles northward of Grande island. It is surrounded by a shoal which extends about 2 cables northward, the same distance eastward, and for $3\frac{1}{2}$ cables in a S.E. by S. direction. A rock apparently dries on the north end of the shoal.

A small black buoy is moored off the south-east extreme of the reef.

Pequeña island, on the east side of entrance to port Súbic, is a third of a mile in length, and 180 feet in height, it stands on a reef connected with the shore which extends half a mile southward and 3 cables westward from the island.

Kalaklan point, at the northern entrance of port Olongapo, is surmounted by a beacon elevated about 11 feet above the highest part of the point. The beacon consists of a wooden frame in the form of a six-pointed star, painted white, with a centre consisting of a star, painted black.

Port Olongapo is about $1\frac{1}{2}$ miles in length, and the same in breadth between Kuby and Kalaklan points, and has general depths of 11 to 18 fathoms. Kuby point has a broad reef extending from it in a N.W. by N.

direction to the distance of $6\frac{1}{2}$ cables. From Pamokan point, about half a mile to the southward, a broad shelf of shoal ground extends $6\frac{1}{2}$ cables in a W. by S. and W.N.W. direction; and at the distance of one mile W.N.W. from this point there is a coral patch, half a cable in diameter, upon which the depth is 3 fathoms. Nakaban point is foul to the distance of $2\frac{1}{2}$ cables.

A red beacon-buoy is moored on the north-west edge of the reef on the south side of the entrance to port Olongapo, with Kubu point bearing S.E. by S.

Caiman shoal, about a cable in extent and steep-to, lies in the fairway of port Olongapo with its centre about dry at low water; it is marked by a white stone beacon. Carrasco shoal lies about midway between Caiman shoal and the southern shore.

Inner basin.—The eastern branch of Kalaklan river discharges in the north-east corner of port Olongapo, and has an estuary half a mile broad. The passage to the inner basin behind the reefs extending from either shore at this part is reduced to about one cable in width, but it has apparently a depth of about 8 fathoms. The edge of each of these reefs is marked by a buoy; that on the starboard hand entering is coloured red, and the buoy on the port hand, black.

Beacons.—Eastward of Rivera point two beacons have been erected on Magdalan bluff, situated between the north and south mouths of the Biniktigan river. These beacons consist of white triangles with vertical black stripes, and when in line lead between the red and black buoys marking the fairway to the inner basin.

The settlement is on Rivera point, and is built along the shore facing the port. Some years ago there was a depth of 30 feet alongside the sea wall of the Navy Yard here, but the wall has fallen in at places, and vessels lying alongside should examine their berths, as several stone blocks project out at certain parts to a distance of about 10 feet from the edge of the wall, with a depth of only 15 feet over them. This will in future be the naval headquarters, instead of Kavite, and it is proposed to construct docks here.

There is a telegraph station at the settlement.

Súbic settlement lies at the head of port Súbic. The shores of the bay within Pequeña island are generally fronted by reefs to the distance of 3 to 5 cables, fairly steep-to; but between Kaguan and Apalit points, the shore reef projects southward upwards of 7 cables.

Kabangan point, close westward of the settlement, has a reef extending 5 cables southward of it, but eastward of this tongue the reef approaches the shore, and there is a depth of 4 to 6 fathoms within a cable of the south side of a portion of the town.

Communication.—Olongapo is connected with Manila, &c., by telegraph. It is proposed to connect Súbic, or Olongapo, with the railway from Manila to Dagupan.

Tides.—It is high water, full and change, at port Súbic, at 9h. 56m.; springs rise $4\frac{1}{2}$ feet; see notes on plan.

Directions.—There is no difficulty in entering port Súbic by the western channel, but the western shore should be kept, passing westward of Mayanga and Pequeña islands if bound to Súbic. Give Pequeña a good berth as the shore reef extends about 3 cables from the island.

If bound to port Olangaipo, when within Grande island, keep Kalaklan beacon bearing eastward of N.E. until “Mancha blanca” (a large white conspicuous mass of rock in the face of the bluff near Patol hill) is seen well open clear of Nakaban point, E.S.E. A vessel will then have passed the outer edge of the shoal extending from Kuby point, and can head in eastward, passing northward of Caiman beacon.

The best anchorage is due South of the Navy Yard on Rivera point, with Caiman beacon bearing West, in a depth of 13 fathoms. Vessels discharging freight outside, anchor north-eastward of Caiman beacon, and close in toward the end of the Navy Yard wall.

When entering the inner basin with the leading marks at Magdalan in line, course may be altered to port when the machine shops on Rivera point are one point abaft the beam, bearing N.W. by N. There is good anchorage anywhere in the inner basin near the Navy Yard. The depth alongside the wreck of the *Marquis de la Victoria* is $2\frac{1}{2}$ fathoms, but anywhere to the westward of it the water is very shallow.

Port Binanga is the first bight southward of the entrance of port Súbic. Small vessels may anchor in 5 fathoms sheltered from all winds, excepting those between west and W.S.W., keeping rather towards Buiong Munti, the southern point of the entrance; Binanga point, on the northern side, is foul to the distance of 3 cables south-westward, and there is a shoal with $2\frac{3}{4}$ fathoms over it one-third of a mile in length, at the same distance south-eastward of it.

A bank with less than 3 fathoms fronts the head of the bay to the distance of half a mile.

The coast from port Binanga trends southward for 3 miles to Mayagao point, thence south-eastward and southward about 16 miles to Luzon point. Between is a deep bight, named Bagak bay, with the town of the same name at its head. The depths in this bay are irregular, and there are shoal patches. The town should be approached only by daylight.

From Luzon point the coast trends about east-south-east for 7 miles to the entrance of Manila bay, and is indented with several coves. Guai bay, the largest of these, affords good temporary anchorage during the north-east monsoon, and is frequented by sailing vessels waiting for a fair tide to enter Manila bay; reefs extend from the entrance points.

This coast is in general steep-to, and may be approached to one or two miles; but it will be prudent to give it a wide berth, as rocks or foul ground extend a considerable distance from some of the points. In Bagak bay reefs extend out from several of the points to the distance of half a mile.

MANILA BAY is pear-shaped, about 30 miles in length and the same in breadth at its upper end; its entrance is about 10 miles in breadth, with Corregidor and Caballo islands situated on the northern side of the main fairway. The depths are about 13 to 14 fathoms, mud and sand, in the centre of the bay and with not less in the entrance, decreasing gradually towards the shores of the bay. It is available for all classes of vessels, and affords them good anchorage, but loading and discharging cargo is interrupted at times by strong winds, especially in the south-west monsoon period.

On account of the great extent of the bay, the typhoons at times prove disastrous to shipping; see storm signals, page 67.

Coast.—From port Mariveles, the coast trends east to Lasisi point, then north-east to Limay point; between the two latter points the shore is fronted by foul ground; and between San José and Real points, fishing stakes extend out 2 miles from the land.

Shoal.—A shoal of 2 fathoms, on which the American ship *Sea Witch* is said to have grounded in 1884, is charted with Real point bearing W.S.W. distant about one mile.

South side of entrance.—**Limbones and Karabao islets** are two rocky islets on the south side of the entrance: between them is Patungan cove, 2 miles in length. From Limbones islet, the coast is high and cliffy as far as Marigondon river, which forms the eastern boundary of the high lands of the Sierra de Pico de Loro.

A semaphore station has been established on Kalumpan point, abreast Karabao islet.

El Fraile rock, which appears like a sail, lies $3\frac{1}{2}$ miles southward of Caballo island, and nearly 2 miles from the south shore of the bay, with depths of 10 fathoms around.

St. Nicholas bank lies about midway between Corregidor island and port Kavite, and with its outer edge about 5 miles off the southern shore. It is about a mile in diameter, with depths of less than 6 feet towards its centre, and steep-to on its north and west sides. A spit with $1\frac{1}{4}$ fathoms on its outer edge extends 3 miles off the south shore abreast, leaving a passage about half a mile wide between it and St. Nicholas bank in which there is a depth of about $3\frac{1}{2}$ fathoms. La Monja rock, seen northward of Corregidor island, leads northward of St. Nicholas bank and beacon.

Beacon.—An iron light-tower on a masonry base, standing about 36 feet above high water, has been erected in a depth of 2 fathoms, on the north-west extreme of St. Nicholas bank, with Caballo lighthouse bearing S.W. by W. $\frac{1}{2}$ W., distant $9\frac{1}{2}$ miles. *See* light, p. 63. The beacon is painted black and white in horizontal bands.

KAVITE HARBOUR, about 7 miles south-westward of the city of Manila, is the port and marine arsenal, of Manila, where vessels are built and repaired. It is at present the United States naval head-quarters, but a transfer to Súbic bay is intended. The naval coaling station is still to be retained at Sangley point. The town is fortified, and stands on a low peninsula, the north extreme of which, Sangley point, is reported to be extending to the eastward. The bay abreast the arsenal has a depth of about $2\frac{1}{2}$ fathoms, affording good shelter for small craft, whence it shoals gradually to its head, which is named Bakor bay.

Other vessels can anchor abreast and within Sangley point in a depth of 4 to $4\frac{1}{2}$ fathoms, mud, sheltered from south and south-westerly winds.

The mainland at the entrance to the port is high and covered with vegetation, while the shores at the head of the bay are low, marshy, and intersected by numerous small rivers, estuaries, and tidal lakes.

Port limits.—The northern boundary of Kavite harbour is an imaginary line half a mile northward of, and parallel to, a line joining Sangley point with Parañaque. The area within this limit is reserved as a naval anchorage, and no vessels other than those under the cognizance of the Navy may anchor therein without permission from the senior naval officer afloat. All vessels must berth according to the directions of the harbour authorities. A powerful tug is available for the assistance of vessels requiring its use.

No ashes, or other refuse, is to be thrown overboard in the port of Kavite. Lighters to remove such matter will call alongside upon the signal—International letter “L” being hoisted, unless prevented by bad weather.

Docking accommodation.—There is a patent slip in Kanaçao bay, Kavite, 270 feet in length by 36 feet in breadth, with a lifting power of 1,200 tons; there are also workshops and appliances for small repairs. There is a Government slip with a lifting power of 500 tons. The dockyard contains all requisites for repairs of every kind, either for steam or sailing vessels, and has modern and complete appliances. There is a coaling pier for small craft in Kanaçao bay, north-east of the patent slip. The frontage to the coal-shed is to be dredged to a depth of 20 feet.

Islands and dangers in Manila bay.—Corregidor and Caballo are two islands dividing the entrance of Manila bay into two channels, known respectively as the North and South channels. Corregidor, the

larger island, nearly 600 feet high, lies near the north shore, and is $3\frac{1}{2}$ miles in length east and west. On its north side is a small bay, protected by breakwaters, affording good anchorage for coasting vessels. From Buri point a reef extends southward nearly to Caballo island.

Caballo is a bluff rocky island 430 feet high, and three-quarters of a mile in length, partially covered with verdure, lying about three-quarters of a mile southward of the east end of Corregidor. A reef extends about 5 cables from its west end; and a doubtful shoal is charted as extending a like distance from its south-east side.

The tidal stream runs strong in the narrow passage between Caballo and Buri point reef.

North side of entrance.—**La Monja**, or Haycock, is a small rock, 131 feet high, situated nearly $2\frac{1}{2}$ miles westward of Corregidor island, with deep water all around it.

Port Mariveles, on the north side of the entrance to Manila bay, is about $1\frac{1}{2}$ miles in length, and one mile in breadth, with good anchorage, sheltered from all but S.E. winds. Excellent water may be procured here.

Some rocky islets, *Los Cochinos*, project half a mile off the west point of entrance. *Monti* the outermost has a rock awash close to its south side, with a patch of $1\frac{1}{2}$ fathoms beyond it, nearly 2 cables southward of the islet, and with a depth of 10 fathoms close-to.

There is a telegraph station at the small village, situated on the north-west shore of the bay.

Vessels may anchor in 17 fathoms, with the village bearing N.W. by W., or they may run farther into the bay if necessary; the bottom being good holding ground, and the anchorage safe.

Quarantine station.—South-west of the village is the quarantine station for Manila. Fronting it is a stone wharf 400 feet in length and 15 feet wide on top; at its outer end there is a depth of 9 feet, and a good boat-landing place with stone steps.

LIGHTS.—On the summit of Corregidor stands a lighthouse 42 feet high, from which is exhibited, at an elevation of 633 feet above high water a *flashing* light, showing *alternately* a *red* flash and a *white* flash about every *ten seconds*, and visible in clear weather from a distance of 21 miles.

A *fixed white* light is exhibited, from a cylindrical grey tower 11 feet in height, on a low spur at the north-east part of Caballo island, at an elevation of 96 feet above high water, which can be seen in clear weather at a distance of about 10 miles. This light is visible when bearing between N. 22° E. (through north and west) and S. 11° W.; also between N. 78° E. and S. 63° E. when not obscured by the high land of Corregidor island.

A *white flashing* light is shown from the beacon on St. Nicholas bank at the height of 34 feet above high water, visible about 4 miles; it is

obscured over eight small sectors of about 3° each in various directions. The light is electric and shows a *flash of twenty seconds' duration*; eclipse *forty seconds*. Defective and temporarily discontinued in January 1902.

A *fixed red* light is exhibited from an iron framework lighthouse on Sangley point at an elevation of 34 feet above high water, visible between the bearings of N. 89° E., through south and west, to N. 31° W., from a distance of 8 miles in clear weather. The light is eventually to be shifted nearer to the extremity of the point which is extending.

A *fixed red* light, elevated 53 feet above high water, is exhibited from a grey tower, on the northern mole at the entrance of Pasig river, and is visible in clear weather at the distance of about 10 miles.

A *fixed red* light is shown at the angle of the breakwater under construction (about $1\frac{1}{10}$ miles S. by W. $\frac{1}{4}$ W. from the Pasig river light) at an elevation of 22 feet above high water, which can be seen in clear weather at a distance of 2 miles.

A *light-buoy*, painted black, is moored in the fairway approach to the Pasig river, from which the Mole head light bears N.N.E. $\frac{1}{4}$ E., distant $4\frac{1}{2}$ cables; the buoys should be left on the port hand by vessels entering the river.

Tides.—It is high water, full and change, in Manila bay, at 10h. 40m.; springs rise about 6 feet. With an easterly wind, the ebb runs out continuously for 18 hours, between Corregidor and the north shore, fairly strong; the flood runs about 6 hours to the eastward, sometimes weak, at other times with considerable strength.

The greatest range of tide occurs generally in June and December, and is about 6 feet; the smallest range of tide is about $3\frac{1}{2}$ feet, generally in March and September. See note on chart, also p. 26.

Directions.—There are practically no dangers for a steam vessel entering Manila bay; the channels on either side of Corregidor and Caballo islands are deep, and the only unmarked dangers are, the shoal extending about 2 cables southward of Monti island, and the doubtful patch of 2 fathoms off Kaukauve point on the northern shore. Both the La Monja and El Fraile islets are steep-to, but Caballo island should be given a berth of a mile; St. Nicholas bank is guarded by a beacon, and La Monja in sight northward of Corregidor island leads northward of it. At night, a light is shown from St. Nicholas beacon, but Corregidor light bearing southward of W.S.W. also leads northward of the bank.

Sailing vessels working in or out must be guided by the lead and the chart. The southern shore of the bay may be safely approached by the lead except in the vicinity of St. Nicholas bank. The northern shore is steeper and a vessel should tack in good time.

When the wind is blowing from the eastward, the current runs out through the North channel stronger than through the South channel,

being narrower; it is therefore advisable at such times to adopt the latter, there being more room in it to work to windward.

Within three-quarters or half a mile of the eastern part of Corregidor island, there are depths of 22 fathoms; and when it can be rounded, stand over for and work along the north shore, taking care not to stand in too near the coast in the vicinity of Kaukauve point; when past Limay point, the north shore has good anchorage over a sandy bottom. Further to the northward and eastward this shore becomes more flat, and the depths decrease regularly.

Anchorage in Manila road.—The bank fronting the city, with depths of less than 3 fathoms, extends about $1\frac{1}{4}$ miles off, and there is a patch of $2\frac{3}{4}$ fathoms beyond the 3-fathoms edge, at $1\frac{1}{4}$ miles westward of the extremity of the moles at the entrance of the Pasig river.

The best and most convenient berth is with the cathedral (square tower) about E.N.E., distant from 2 to 3 miles, in the depth of water preferred, from 4 to 6 fathoms. During the north-east monsoon vessels can anchor closer to the mouth of the river, but in the south-west monsoon period strong winds from that quarter raise a sea here. It is difficult to make out Manila cathedral at a great distance; there is a low cupola over the centre of its nave, and no other turrets.

Merchant vessels above 13 feet draught usually have to discharge part of their cargo in the road before entering the river. Loading and discharging in the road is tedious, and is much retarded by the fresh afternoon breezes, when an unpleasant sea prevails.

Fishing stakes encumber the banks fronting the shore out into depths of 5 fathoms or more in places.

Manila, as a port, suffers from the lack of shelter in the bay, especially during the south-west monsoon. When heavy weather sets in communication with the shore is often interrupted for days at a time. Small vessels, such as the inter-island coasters, and some of the Hong Kong steamers, are able to ascend the Pasig river, but all larger craft lie at a distance of from one to $2\frac{1}{2}$ miles from the shore. This entails the use of lighters and their attendant launches, increasing the heavy expenses which are incurred by vessels at this port.

Harbour accommodation.—Pasig river.—New Harbour.—Pasig river divides the city of Manila into two portions. Its entrance, confined between two moles, extending westward from its north and south points, has now a depth of about 14 feet on the bar at low water, and 25 feet in the harbour, with accommodation for vessels that can cross the bar alongside the wharves. The channel is buoyed, but the depth on the bar is constantly altering, rendering frequent dredging operations necessary. It is intended to dredge the river as far as the bridge of Spain, to a depth of 16 feet at mean low water.

Pasig river is the principal channel of communication with the interior, and is navigable for about 10 miles; its average breadth is about 350 feet, with depths from 3 to 25 feet.

Just within the extremity of the south mole is the western mole of the new harbour, extending about a mile in a S. by W. $\frac{1}{2}$ W. direction and then bending to about south a farther quarter of a mile, to the 3-fathoms edge of the shore bank; except at the latter part, the breakwater is well above water. The eastern pier will also be about a mile in length, in a W.S.W. direction, forming a capacious harbour, with a narrow entrance between the two piers. The above works were not expected to be completed before the year 1905, if then. It has, however, recently been decided to extend the breakwaters as formerly planned; to dredge within them an area of 350 acres to a depth of 30 feet; build masonry quays for berthing ships alongside; and otherwise enlarge generally upon the original scheme.

Tugs.—Tugs are obtainable for towing vessels into the river.

THE CITY OF MANILA is situated at the mouth of Pasig river, on the eastern shore of the bay about 25 miles from its entrance. It is the capital of Luzon, one of the largest of the Philippine islands, and was until recent years the seat of the Spanish Government in the East. Tramways run in the principal streets, and electric lights have been laid in the public squares, chief streets, and business houses. The southern part of the city, surrounded by a wall, and containing the Government offices, citadel, hospitals, &c., is separated from the northern and commercial quarter, named Binondo, by the river Pasig. On the south-east side of Manila bay is the town and arsenal of Kavite; see p. 61.

Trade.—The principal industries are in the hands of the Chinese, of whom alone some 50,000 inhabit the town and suburbs of Manila. The imports of Manila from Europe are fine yarns, cottons, corrugated and sheet iron, cutlery, earthenware and glassware; gunny bags, wines, and other comestibles; from China, flour, petroleum, silk, &c. Its exports are sugar, rice, hemp, tobacco, cigars, hides, timber, gum mastic, mother-of-pearl, coffee, indigo, rhubarb, &c.

In the year 1896 (the latest for which complete returns are available in consequence of the unsettled state of affairs) the value of the exports was about 2,900,000*l.*; and of the imports about 2,200,000*l.* In the year 1900, 462 foreign-going vessels of 673,148 tons, and 1,788 coasting vessels of 335,259 tons, making a total of 2,250 vessels with an aggregate of 1,008,407 tons, entered the port of Manila. Of the above, 295 vessels of 502,627 tons were British; of these 212 vessels of 323,152 tons traded direct from and to the United Kingdom and British Colonies, and the remainder from and to other countries.

See chart, No. 976 [2,665].

The country continues in a disturbed condition, and import and export trade have suffered in consequence, the former owing to the closing of large districts to trade, the latter owing to agricultural operations being suspended over the greater part of the islands.

The **population** of Manila city in 1887 was about 154,000; of Manila province, as estimated by the Philippine Commissioners, 1899, 500,000.

Quarantine regulations have hitherto been very strict, often entailing great inconvenience on vessels arriving. The station is at port Mariveles, *see* p. 62.

Communication.—There is frequent communication by steam-vessel with Hong Kong, whence there is weekly communication with Europe; there is also occasional mail communication with the Caroline and Ladrone islands. *See* also p. 29.

Railway.—Telegraph.—There is a railway between Manila and Dagupan in Lingayen gulf, 123 miles in length; and telegraphic communication between the principal places in Luzon. A submarine telegraph cable connects Manila and Hong Kong, and cables also connect Manila with Panay, Negros, Sebu, Leite, Mindanao, Sulu, and all the principal islands. *See* p. 30.

Climate.—The year may be divided into three seasons, the first—cold (65°) and dry for the tropics—commences in November; the second—warm but still dry—commences in March, the greatest heat being experienced from April till the end of May (90°–98°); and the third, which is extremely wet, continues from June to the middle of November. During the rainy season, inundations of rivers are frequent, and travelling in the interior almost impossible. During the months of June, July, and August, the air of Manila is rendered impure by exhalations from the swampy land around; and the weather being sultry, with much rain at times, febrile complaints are then likely to appear. Care should be taken to avoid exposure to the sun. There is a good native hospital (attended daily by an English doctor) to which sick merchant seamen are sent.

Winds.—The north-east monsoon blows strong out of Manila bay at times accompanied by a cloud resembling smoke, which is driven out of the bay to the south-west, and forms an arch in that horizon, when the sky is otherwise clear; but sometimes sea breezes from the south-west blow into the bay in the north-east monsoon after mid-day, increasing in strength as you advance into the bay.

During the strength of the north-east monsoon, although the wind may be fresh at the entrance, it will frequently be moderate within the bay.

At the season of the south-west monsoon, storms, known locally as “collas,” blow from S.W. to West, and are accompanied by violent squalls and much rain; they often last for several days.

See chart, No. 976 [2,665].

Land winds, during the north-east monsoon, blow from East in the bay and from S.E. on the south coast north of Fuego point; they commence about 4 or 5 p.m., fall towards midnight, then set in again from North changing to N.E. during the day, and East towards the evening. When hard North or S.W. winds are prevalent there are generally no land winds.

Typhoons frequently occur, and are generally most severely felt in the months of September, October, and November. One that occurred on October 21, 1882, drove 12 ships ashore. Notice of their approach is given from the observatory at Manila, which is in telegraphic communication with a station at the north point of Luzon.

Manila is also visited somewhat frequently by earthquakes.

Storm Signals.—The following storm signals are shown from a signal staff at the Harbour office, in Pasig river; also from a storm signal station about half a mile westward of the cathedral, where they are visible from the roadstead. These warnings are based upon information collected at the observatory at Ermita. During the day the signals are made by means of a *drum*, *cone*, *ball*, and *flag*; and at night by *white* and *red* lights.

The night signal lights are hoisted vertically at the Harbour office; at the other position, they are hoisted horizontally at three separate masts, and should be read from left to right. The day signals are shown vertically.

1. A *drum* indicates a distant storm, in an unknown direction. Should the storm approach, the signal will be changed. At night, *two white* lights are shown.

2. A *cone*, *point upwards*, above a *drum*, indicates that a cyclone will pass some distance to the northward, and that strong gales between south and west are probable. At night *one white* light and *one red* light are shown (*white* light uppermost at the harbour office staff).

3. A *drum* above a *cone*, *point downwards*, indicates that a cyclone will pass some distance to the southward, and that strong winds between east and south are probable. At night *two red* lights are shown.

4. A *ball* above a *cone*, *point upwards*, indicates a cyclone in a position dangerous to the locality, without being imminent, leaving time for further notice. At night *three white* lights are shown.

5. A *cone*, *point upwards*, indicates that a cyclone will pass close northward, and that heavy gales from north, through west to south, are probable. At night *one red* light between *two white* lights are shown.

6. A *cone*, *point downwards*, indicates that a cyclone will pass close southward, and that heavy gales from north, through east to south, are probable. At night *one white* light and *two red* lights are shown (*white* light uppermost at the harbour office staff).

7. A *ball* indicates the imminent approach of a cyclone. At night *one white light* between *two red lights* are shown.

8. A *flag* (of any colour) above a *ball* indicates a heavy freshet, and that entering or leaving the river is prohibited, and all boat traffic stopped. At night *three red lights* are shown.

On any one of the above-mentioned signals being made, mariners should take every possible precaution to ensure the safety of their vessels.

The **standard time** kept in the Philippine islands is that of the meridian of long. 120° E., or 8 hours fast on mean time at Greenwich.

Time signal.—A time signal is in operation at the Meteorological office, a tower with a flat roof, on the sea wall of the fort. The signal is a ball, which is hoisted to the top of the staff at five minutes before the signal, and dropped at noon mean time of the meridian of long. 120° E. (0h. 3m. 52s. local mean time)—equivalent to 16h. 0m. 0s. Greenwich mean time. In case of failure the ball will be slowly lowered five minutes after the signal time.

Observatory.—The observatory, situated in Ermita, has been established for many years, and is under the direction of the Jesuit Fathers.

It is complete with meteorological instruments of every description. There are also a great number of seismological instruments, most of which are self-recording, and there is a magnetic observatory.

The library contains almost every known work on meteorology and astronomy in all European languages.

Telegrams are received daily from all parts of the far east reporting the weather, and in the typhoon season valuable warnings are sent from this observatory to the coast of China.

Supplies.—Coal.—There is generally from 3,000 to 4,000 tons of coal kept in stock at Manila. A large quantity is brought from Moji in Japan, and Newcastle, New South Wales.

Vessels are coaled from lighters, in the road; about 150 tons may be put on board by day and 250 tons if working day and night. Coaling is occasionally impeded in the south-west monsoon period.

Water can be purchased, and is brought alongside in steam water-tanks. The water is led by pipes from Santatan on the Pasig river to Manila. Fresh beef, vegetables, bread, and other supplies are obtainable. A cold storage company, established in 1900, has improved the quality of victuals considerably. Australian fish and meat, and usually English game, are kept in stock.

SOUTH-WEST COAST of LUZON.—Although this coast is out of the ordinary track of vessels passing up and down the China sea, yet

See chart, No. 976 [2,665].

it is of importance when proceeding to or from Manila, within the Lubang islands. Vessels navigating along it should keep near the shore when the tidal stream is adverse.

From Limbones island the coast trends southward about 7 miles to Fuego point, and is intersected by various bays. It is elevated, rocky, and steep-to, with several islets in its vicinity.

Port Jamelo, situated about $4\frac{1}{2}$ miles southward of Limbones islands, in the bay of the same name, is from 4 to 5 cables broad in its entrance, with depths of 14 to 16 fathoms, decreasing gradually towards the shore.

The best anchorage is on the north side in 3 to 7 fathoms. Mangroves grow near the mouth of the river which discharges at the head of the port, the shore of which is low.

Depths.—The depths off this part of Luzon are irregular, varying from 30 to 110 fathoms, and afford but little or no warning when approaching the dangers, close to which are 17 to 60 fathoms; consequently the navigator will have to approach the coast with caution.

The Coast.—Fuego point is moderately high and rocky, with an islet off its north side. Two other islets, connected by a reef, lie $1\frac{1}{2}$ miles S.S.E. of the point, with a pinnacle rock, awash at low water, on their eastern side. Several rocks lie about one mile to the southward of Fuego point.

Nasugbu bay, about 5 miles south-eastward of Fuego point, is formed by low land with a dark sandy shore, which is steep-to and wooded. About the middle of this bay the river Lian discharges, on the bar of which is a depth of 2 feet at low water. The town of Nasugbu, containing about 7,800 inhabitants, is situated on the north bank of the river. Anchorage during the north-east monsoon can be obtained in front of the bar of the river Lian, in a depth of 5 to 7 fathoms, sand.

A shoal, one cable in length east and west, with $4\frac{1}{2}$ feet water over its eastern extremity, lies 4 cables from Nasugbu point.

Fortune island, 450 feet high, situated 6 miles south-westward of Fuego point, is about a mile in extent, bare and steep-to, with some rocks off its south-eastern side.

Talin bay, north of Talin point, situated 10 miles southward of Fuego point, is $3\frac{3}{4}$ miles wide, but open to the north-west, and foul; its shore is composed of rocky cliffs and sandy beaches. Talin point is of moderate height, and surrounded by reef to the distance of a cable; a S.W. patch with a depth of 7 fathoms is reported to exist about 3 miles rocky by S. from it.

The Coast.—From Talin point the coast trends in a southerly direction 9 miles to Kalatayan point, and is very low, with sandy shores and mangroves; it is also intersected by several estuaries, and is fronted by a reef which extends nearly 2 miles off; from Kalatayan point the

See chart, No. 2,577 [2,656].

coast trends south-easterly 3 miles to cape Santiago. Depths of 14 to 17 fathoms will be obtained half a mile from the edge of the reef.

The depths off this part of Luzon are irregular, varying from 30 to 110 fathoms, and afford but little or no warning when approaching the dangers, close to which are 17 to 60 fathoms.

Cape Santiago.—The south-west extreme of Luzon island is moderately high, wooded, and surrounded by a reef which dries out to the distance of about a cable from the shore.*

LIGHT.—From a brick conical tower with white lantern, 51 feet in height, erected on the south-west side of Santiago point, is exhibited at an elevation of 90 feet above high water a *group-flashing white* light with a period of *thirty-six seconds*, visible seaward between the bearings of S. 38° E., through east and north to West, from a distance of 16 miles in clear weather.

The light shows *three* consecutive flashes of *four seconds* each with eclipses intervening; interval between flashes two seconds, between groups of flashes twenty seconds.

Telegraph.—There is a semaphore station on cape Santiago, in connection with Manila by telegraph.

Caution.—The channel between the south-west coast of Luzon and the Lubang group, and also that southward of them, is subject at times between the hours of 4 and 10 a.m. to heavy off-shore squalls, rendering it necessary for vessels under sail to keep a good look-out so as to shorten sail in time, or to navigate the channels under reduced canvas.

Simo banks, about 14 or 15 miles northward of the Lubang group, consist of two banks with a least-known depth of 8 fathoms on them. The western bank extends 2 miles north and south and lies with Fortune island bearing E. $\frac{1}{2}$ S., distant 12 miles. The eastern bank lies 4 miles nearer Fuego point. There are irregular depths of 20 to 100 fathoms near these banks.

LUBANG ISLANDS are a detached group of six islands that front the south-west end of Luzon and the north-west end of Mindoro. They are uninhabited with the exception of Lubang island, which has a population of about 3,000. The only safe anchorage for vessels during all seasons is the port of Tilig, situated on the north-east coast of Lubang island.

* Minerva rock, upon which the *Minerva* is reported to have struck at 2 a.m., September 10th, 1834, and on which an American ship was supposed to have been wrecked several years previously, is said to be a rock, having a depth of 17 fathoms near it, and to be situated in the fairway of the entrance to Balayan bay, with cape Santiago bearing N.W. $\frac{1}{2}$ W., distant 4 or 5 miles. This rock was searched for unsuccessfully, by the Spanish Hydrographic Commission under Captain D. Claudio Montero, and has been erased from the Spanish charts.

See chart, No. 2,577 [2,65]

Cabra island, the north-westernmost island of the Lubang group, is 2 miles in length, north-west and south-east; it is a flat-topped, wooded island about 200 feet in height, with a reef projecting half a cable from its north-east side. There appears to be no off-lying danger.

In the voyage of H.M. surveying vessel *Sulphur* it is observed:—"Both the *Starling* and *Sulphur* shaved the surf-line of Cabra without obtaining soundings."

The channel between this island and Lubang is about $1\frac{1}{2}$ miles broad, and may be safely navigated, as the reefs on the north side of Lubang always show. In this channel the flood sets northward and the ebb southward.

LIGHT.—From a square brick tower, 67 feet in height, erected near the west extreme of Cabra island, is exhibited at an elevation of 217 feet above high water a *group-flashing white* light with a period of *one minute*, visible seaward between the bearings of S. 49° W., through south and east to N. 39° W., from a distance of 22 miles in clear weather. The flashes show thus:—*flash* eight seconds, *eclipse* seven seconds, *flash* eight seconds, *eclipse* thirty-seven seconds.

Lubang island, 16 miles in length, north-west and south-east, is the largest and most important island of the group; it is high in the middle, but low at each extreme and for several miles within its north end.

Its coasts are fronted by a reef to the distance of about a quarter of a mile; the south-west coast is rocky. On the eastern and north-eastern sides are several bays, affording more or less protected anchorage.

Port Tilig, on the north-east side of Lubang, is the only safe anchorage for small vessels in all seasons; it is sheltered from all winds and has good holding ground. The entrance faces N.N.W., has depths of $5\frac{1}{2}$ to 14 fathoms in the fairway, and the reefs on either side mark the channel during rough weather. The western shore can be approached until the anchorage, in front of the bastion, is reached, where there are depths of 4 to 5 fathoms, mud and sand. The head of the bay is occupied by a shoal, dry at low water, dividing the anchorage.

The San Vicente bastion, on the west point of the entrance, is a square stone tower, upon the parapet of which stands a wooden house.

Ingress and egress, unless in very favourable weather, owing to its being on a lee shore, is questionable for a sailing vessel.

Cattle, pigs, and poultry can be obtained here at moderate prices, also a fair supply of water.

Tides.—It is high water, full and change, in port Tilig at 9h. 30m.; approximate rise at springs, 5 feet.

Afuera bank is $1\frac{1}{2}$ miles in length, east and west, by three-quarters of a mile in breadth, with two heads of $2\frac{3}{4}$ fathoms, from the outer of which the north point of port Tilig bears about South, distant 2 miles.

Luk bay, on the east side of Lubang, about 7 miles south-eastward of port Tilig, affords safe anchorage, being somewhat protected from north-east winds by Ambil island.

A reef extends 4 cables northward of the south point of entrance and 2 cables south-eastward of the north point, and there is a patch which dries about midway between, with a passage 3 cables wide on either side of it.

Good holding-ground will be found in depths of from 10 to 20 fathoms at and a little within its entrance points. Under the former depth it suddenly shoals, and several coral reefs encumber the bay and bar direct access to the inner depths between these barriers, where a short steam-vessel might be moored in excellent shelter.

In approaching the bay from the south-eastward, the $3\frac{1}{2}$ -fathoms patch, situated about 3 miles eastward of the southern point of the bay, should be given a good berth.

Supplies.—At the village of San Rafael at the head of the bay is a stream of good water, accessible at high tide. Bullocks, poultry, and vegetables can be obtained.

Ambil island, about $4\frac{1}{2}$ miles in length east and west, has a conical mountain about 2,500 feet high, with a plain on its western side. The north-east coast is high and rocky, with an open bay, in which are depths of 10 to 11 fathoms. On the west side is a bay half a mile broad, in which anchorage can be obtained in 4 fathoms, mud; a reef extends 2 cables from the shores of this bay.

The passage between Ambil and Lubang is clear, but caution is necessary on account of the reefs, which contract the channel to one-half its apparent breadth. The flood stream sets southward, and the ebb northward, through this channel.

Ambil bank has a rock in its centre with $1\frac{1}{2}$ fathoms over it, situated about $1\frac{1}{2}$ miles west of the north extreme of Ambil island; the bank is crescent-shaped, 2 miles in extent, with general depths of 4 to 5 fathoms.

Mandani island, one mile off the north-east side of Ambil island, is half a mile in extent, with two hills of unequal height. On the south-west side is a shoal at a cable from the shore, the other sides are steep-to.

Malavatuan island, 3 miles north-north-east of Ambil, is 3 cables in extent, and covered with brushwood. It is steep-to, and has a passage $1\frac{1}{2}$ miles broad between it and Mandani island. North-westward of this

See chart, No. 2,577 [2,656], and plan of Luk bay, 972 [2,660].

island are banks on which the least depth appears to be 6 fathoms, with deep water around.

Golo island, a high but narrow island, 8 miles in length, with reefs off its north-east, east, and south-east points, adjoins the south-eastern extreme of Lubang. No soundings are shown on its south side, but a reef is known to extend about one cable or more. H.M.S. *Teazer*, 1872, anchored in 13 fathoms, mud, near this side, with cape Kalavite bearing S. $\frac{3}{4}$ W., and the eastern extreme of the land S.E. by E. $\frac{3}{4}$ E. About a quarter of a cable nearer the shore depths of 4 to 5 fathoms, coral, were obtained.

The channel between this island and Lubang is 4 cables wide, with a rock nearly awash in its centre. The flood stream runs to the south, and the ebb to the north through this channel.

MINDORO ISLAND, WEST COAST.—Very few soundings have been taken off the west coast of Mindoro, but the water is found to be deep close-to in many places; for vessels passing through Mindoro strait there seems to be no necessity for closing the shore.

Some high ranges of mountains extend throughout Mindoro; one of the peaks, Mount Halcon, situated at the north-east part of the island, is 8,865 feet in height.

Cape Kalavite is the north-west extreme of Mindoro. Between it and Paluan bay the water is deep near the shore; for the few rocks interspersed along the coast lie close in, and one of them, near the cape and just above the water, has a sandy beach abreast it. Mount Kalavite, within the cape, the summit of which is about 2,000 feet high, and dome-shaped, appears very regular when seen from the westward, and is visible from a considerable distance in clear weather.

PALUAN BAY affords good shelter in the north-east monsoon, and is also a convenient place for vessels to obtain supplies when passing through Mindoro strait. The bay is 5 miles wide at its entrance, and free from dangers for 3 miles in a northerly direction. Reefs, dry at low water, extend half a mile from either point of entrance, having deep water close-to.

The best anchorage is in the north-eastern extremity of the bay in 14 fathoms (to which depth the water suddenly shoals from 20 fathoms), with the Black rock off the cliffy head on south side of the entrance to the stream, bearing East distant $1\frac{1}{2}$ miles. The bottom consists of a black, tenacious mud.

A reef projects about 4 cables beyond the Black rock, and has depths of 10 to 12 fathoms close to its edge.

Water is obtainable from the river. The village of Paluan is charted on the north point of the entrance.

Caution.—Care must be taken when working into Paluan bay, for the squalls come violently off the high land, are very sudden, and at night do not give the least warning.

Tubile point, 6 miles southward of the entrance to Paluan bay, has two islets on its south side, which, with the point, are steep-to.

Mamburao reef projects about 3 miles southward, from Karanisan point, situated 5 miles eastward of Tubile point, and has a depth of one fathom over it at low water. Anchorage can be obtained off the mouth of Mamburao river, westward of the reef, in a depth of $4\frac{1}{2}$ fathoms, mud and sand, with shelter from north and east winds.

The coast, south of Mamburao reef, trends south-eastward to Talabasi point, and is low and sandy. From this point, which is surrounded by a reef, the coast continues in the same direction to Sablayan point.

Pandan islands.—The two islands of Pandan are situated from one to 2 miles northward of Sablayan point; the southern one is apparently connected with the shore by shallow water. Protection may be obtained, during the south-west monsoon, by anchoring close eastward of the southern island, in 7 to 14 fathoms, mud. In order to reach this anchorage, pass to the northward, or between the islands.

Sablayan anchorage is 8 cables wide between Sablayan point and the coast to the eastward, but the available space is reduced one-half by reefs on both sides, and the northern part is filled by a reef enclosing a lagoon 4 to 5 fathoms deep, to which there is a narrow entrance. Anchorage may be obtained in 12 fathoms, with the mound on Sablayan point bearing West, at the distance of a quarter of a mile from the beach; and in a depth of 9 fathoms, further in, with the mound bearing W. by S., but caution is necessary as the reefs do not show well. The inner lagoon is only suitable for native craft.

Sablayan town, on the western side of the anchorage, contains about 1,600 inhabitants, and there is a church and school. Fowls, fish, cocoanuts, and water are obtainable in small quantities.

The coast from Sablayan anchorage trends south-eastward for 35 miles to Mangarin, and is generally low, with sandy beaches. The low land extends a considerable distance inland, where it is backed by ranges of mountains.

Dongon bay is situated 7 miles southward of Sablayan anchorage, eastward of a low, sandy point of the same name; vessels can anchor here in front of the low, sandy shore, protected from northerly winds.

Iriron bay, about 8 miles south-eastward of Dongon bay, affords good anchorage for small craft during the north-east monsoon; a village is

See chart, No. 2,577 [2,656], and plan No. 949 [2,659].

situated on the north side of a small river, but no supplies could be obtained.

Lumintau point lies 6 miles south of Iriron bay, and has a reported small shoal at half a mile to the north-westward (not shown on the chart).

Mangarin bay, 14 miles south-eastward of Lumintau point, and north of Ilin island, is about one mile wide in its entrance, where there are depths of about 3 fathoms, whence it shoals gradually to the settlement at its northern head. Mangarin peninsula and point terminate in a sandy spit, projecting eastward about a quarter of a mile. Boats only can reach the settlement, which numbers about 1,900 inhabitants. The water is bad, and its climate unhealthy on account of its marshy surroundings.

Shoals.—Donjon rock, dry at low water, lies $4\frac{1}{2}$ miles W. $\frac{1}{2}$ S. of Mangarin point; it is surrounded by a reef to the distance of one-third of a mile, and there is a reef half a mile south-west of it, not thoroughly examined. Nearly midway between Donjon rock and Mangarin point lies Manadi rock, dry at low water, also surrounded by a reef; between it and the point is a sunken reef. These reefs are steep-to.

Ilin island lies parallel to the south-west part of Mindoro, is 10 miles in length, and from $1\frac{1}{2}$ to 4 miles in breadth. The south extreme is bold-to on all sides. Mount Ilin, on its north end, is about 850 feet in height.

Northward of the town of Ilin a spit extends $1\frac{1}{2}$ miles from the shore, with a bank beyond it, from the outer edge of which mount Ilin bears E. by N., distant about $3\frac{1}{2}$ miles.

Ilin town.—**Anchorage.**—The town of Ilin, on the west side of Ilin island and one mile northward of Ambolon, contains about 500 inhabitants. A reef extends half a mile seaward, off which good anchorage will be found in a depth of 10 fathoms. The depths appear to be very irregular, and there is a small 4-fathoms patch off the entrance to the boat passage.

Supplies.—A channel, staked by the natives, leads up to the settlement, where a stream discharges into the sea, but much sweeter water was found trickling over a cliff just round the town point to the southward, to which boats have easier access. Fowls, eggs, grain, and vegetables were procurable at reasonable prices.

Ambolon island, westward of Ilin island, is about 3 miles in length and $1\frac{1}{2}$ miles in breadth; its north and south extremes are from 400 to 550 feet in height. The dangers on the seaboard of this island are all visible and easily avoided.

A shoal, nearly a mile in diameter, lies three-quarters of a mile S.S.E. of the south point of Ambolon island; a rock above water near its south-west end sufficiently guards it.

The channel between Ambolon and Ilin is navigable by vessels under steam or with a fair wind; a patch of $2\frac{1}{2}$ fathoms lies in the southern fairway, and others of about 4 fathoms, for which *see* the chart

Pandarochan bay, between Burunkan and Ilin points, the south extremes of Mindoro and Ilin islands, is safe throughout, affording good anchorage and shelter from northerly winds at the mouth of the strait between those islands, in a depth of 10 to 12 fathoms. Garza island and its extensive shoal also offer shelter from strong easterly gusts.

The strait between Ilin and Mindoro is free from danger, but owing to the prevalence of light airs should not be attempted by a sailing vessel without a fair wind. Caution must be used when entering Pandarochan bay from the northward by this strait, for the water on the Mindoro side shoals suddenly to 3 fathoms. Keep the channel well open, therefore, borrowing rather on Ilin until Garza island is nearly locked in by Burunkan, the eastern point of the bay; then haul eastward, anchoring in 12 fathoms.

Water may be obtained in Lalaugan bay.

Garza island, $2\frac{1}{2}$ miles westward of Burunkan point, is a low and sandy islet covered with trees, and encircled by a reef which extends 2 miles southward with depths of $2\frac{1}{2}$ fathoms in places.

Dominga shoal (position doubtful), charted in lat. $12^{\circ} 3' N.$, long. $121^{\circ} 7\frac{1}{2}' E.$, about 6 miles southward of the south-eastern end of Ilin, is reported by the natives of that island to have a least depth of $3\frac{1}{2}$ fathoms; it is stated to be two miles in extent. Depths of 8 and 9 fathoms, sand and rock, were obtained upon it by the *Dominga* in May 1888

MINDORO STRAIT. — This wide strait, separating the Kalamianes from Mindoro island, is one of the most frequented channels for vessels which leave Manila for India towards the end of April, and throughout the south-west monsoon period; and at all times of the year from the ports of China to Australia.

It is divided into two passes by Apo island and reef.

Apo island and reef.—Apo island is about half a mile in extent, covered with trees, and visible from a distance of about 10 miles. White beaches front its north and east sides, and the reef surrounding the island extends about half a mile in places. It is separated from Apo reef by a narrow channel with a depth of 90 fathoms, no bottom. The island is about 22 miles westward of Dongon point, the nearest part of the coast of Mindoro, and nearly the same distance from Tara island, the nearest

See charts, Nos. 971 [2,658] and 2,577 [2,656].

of the islands outlying Busuanga on the western side of the channel, and lies in lat. $12^{\circ} 40' N.$, long. $120^{\circ} 24' E.$

Apo reef is about 10 miles in length in a north north-west and opposite direction by about 6 miles in breadth. Near its western edge is Menor islet, a barren, black rock, about $1\frac{1}{2}$ miles eastward of Apo island. Towards the eastern edge of the reef are other rocks above water, visible some miles off. At low water many small rocks are dry on the reef, particularly along its north side; the whole of the reef is steep-to.

Apo East pass is $14\frac{1}{2}$ miles wide between Apo reef and the nearest part of the coast of Mindoro; discoloured water with tide-rips have been observed in places some 7 miles off the coast between Dongon point and the Ambolon group, but soundings in one gave no bottom at 100 fathoms; there are no known dangers in it.

Discovery bank, in the fairway of Apo East pass, was surveyed in 1872 by the Spanish surveying ship *Mindoro*, which anchored on it several times. It is $1\frac{1}{4}$ miles long, north and south, and very narrow; the least water on it is 9 fathoms. The sea does not break on the bank, nor is it marked by any discolouration of the water. From the centre of the bank, the northernmost of the two Pandan islands off Mindoro bears N N.E. $\frac{1}{4}$ E.; mount Kalavite N. by W. $\frac{1}{2}$ W.; and Apo islet W. $\frac{1}{2}$ S.

Sarraceno or Saracen bank is about $1\frac{1}{2}$ miles in extent from north to south, and the same from east to west, and has a least depth of 14 fathoms, with mount Ilin bearing N.E. by E. $\frac{3}{4}$ E., distant 16 miles. The shallow part is of red coral, but as the depth increases the character of the bottom alters, and at 50 fathoms it consists of coarse sand and gravel.

Leonidas shoal, about $3\frac{1}{2}$ miles in length north and south, and $2\frac{1}{2}$ miles wide, is composed of coarse sand with shells and coral. From the position of least depth, 8 fathoms, the northern end of Ambolon appears well within the northern end of Ilin bearing N. $34\frac{1}{2}^{\circ}$ E., the former distant 12 miles; and the south point of Ilin N. 66° E.

Panagatan reef, at the south-eastern entrance to Mindoro strait, and 4 to 8 miles westward of Sibay island (see page 235), is about $4\frac{1}{2}$ miles in length north-west and south-east, and $2\frac{1}{2}$ miles in breadth. There is an islet upon it covered with low bushes, which appears to be increasing in size, and was in 1892 about 3 miles long. The reef is apparently steep-to, but temporary anchorage may possibly be found on a bank extending from its south-east end.

Directions.—Vessels navigating Apo Eastern pass should follow, both day and night, the pecked line marked on the chart, which line leads about 4 miles westward of the Pandan islands and Dongon point.

Apo reef should be avoided, as the lead will give no warning of approach to it, and the reef does not always break, but bearings of Apo island and the Pandan islands, and other objects, will enable the position of a vessel to be accurately fixed during daylight.

Apo West pass, or Northumberland strait, is 19 miles wide between Apo island and reef and the islands outlying Busuanga, and is deep throughout the fairway.

Hunter and Merope rocks lie in the northern entrance.

Hunter rock, on which the sea breaks, consists of a rocky ledge 2 cables in extent with a patch of $1\frac{1}{4}$ fathoms on its south extreme, and has depths of 18 to 40 fathoms around. From the rock mount Kalavite bears N. by E. $\frac{1}{2}$ E., and Apo island E. $\frac{1}{2}$ S., distant about $12\frac{1}{2}$ miles.

Merope rock, on which the sea breaks, lies $5\frac{1}{2}$ miles north-east of Hunter rock, and consists of a ridge $1\frac{1}{2}$ miles in extent north and south, and half a mile wide; the least depth is $2\frac{3}{4}$ fathoms, and there is no bottom with 90 fathoms within a quarter of a mile. From the rock mount Kalavite bears N. $\frac{3}{4}$ E., and Apo island E.S.E.

Weather.—Land and sea breezes were experienced here in March, the latter from West and S.W., with the tidal stream or current setting northward; land and sea breezes prevailed also to the westward of the Kalamianes. The set of the current depends chiefly on the prevailing wind; a current setting south-eastward at the rate of 0.6 miles an hour has been observed.

The KALAMIANES.—General remarks.—The Kalamianes are a group of high islands lying between the north-east end of Paláwan and Mindoro, and extending between the parallels of $11^{\circ} 39'$ and $12^{\circ} 20' N.$, and the meridians of $119^{\circ} 47'$ and $120^{\circ} 23' E.$ Busuanga, the largest island of the group, is about 34 miles in length north-west and south-east, and 18 miles in breadth. It is irregular in form, with numerous deep bays. The islands and reefs which front its north-east side form the western side of Apo West pass or Northumberland strait, the western channel of Mindoro strait.

These islands form, with the northern part of Paláwan and the Cuyos islands, a province, the capital of which is Taytay. All these islands are, generally speaking, hilly and broken. The industry of the locality is in collecting edible birds' nests, honey, and wax; but cultivation is not practised to any great extent. The forests produce good timber for building or cabinet work. The population of the group amounts to about 16,400.

Climate.—The climate of these islands is in general hot and unhealthy; intermittent fevers and cutaneous diseases prevail, attributable

See chart, No. 2,377 [2,656].

in all probability to excessive moisture and the bad quality of the drinking water.

The west coast of the Kalamianes, Linapakan, and its surrounding islands, and the coasts of Paláwan, are described in the China Sea Directory, Vol. II.

Off-lying islands and dangers.—**Kolokoto, or North rock**, is the north-western and highest of four large black rocks, which appear as one when seen bearing S.E. by E. or in an opposite direction; it was estimated to be 100 feet high. Kolokoto is the northernmost of the islands which lie on the north side of Busuanga, and may be seen from a distance of 13 to 14 miles.

The depths northward and eastward of the Kalamianes are very irregular, 17 to 30 fathoms, with patches of 5 and 8 fathoms, and it is necessary to be on the look-out for shallow water when navigating in this locality.

A patch of 5 fathoms is shown on the charts 10 miles N. $\frac{1}{4}$ W. of Dichilem rock. H.M.S. *Flying Fish* anchored on this bank, which is of small extent, and sounded over it in boats, but found nothing less than 10 fathoms, with 25 to 30 fathoms around.

Dimipak, or High island, lies about 2 miles northward of the north point of Busuanga. It is not quite 2 miles in extent, and the channel between it and Busuanga does not appear to be free of danger, as some rocks were seen above water eastward of the island.

North-west, or Dichilem rock.—About a mile north-westward of Dimipak island are rocks above water, one of which, Sail rock, 140 feet high, is remarkable; and $1\frac{3}{4}$ miles north-westward of this lies a black rock, named North-west rock or Dichilem, with a depth of 38 fathoms between. About 2 miles N.N.E. of Dichilem is a coral patch of 8 fathoms.

Tanobon island, standing on a reef about 2 miles in length north-east and south-west and one mile in breadth, lies about 3 miles south-eastward of Dimipak island. About midway between Tanobon and Dimipak there is a submerged rock.

Dumunpalit (Turret) island, situated 7 miles south-eastward of North rock, is 816 feet high, with several detached rocks about it, and a hummock on its south-west point, somewhat like a turret.

Nanga islets, 15 miles E.S.E. of North rock, are two wooded islets with sandy beaches, the largest being 344 feet high. About $1\frac{1}{4}$ miles N.N.E. of the islets is a black rock above water on the reef which surrounds them.

Kamanga islets, south of Nanga, are about 400 feet high, and clifty; the chart shows them to be surrounded by a reef.

Tara island.—When seen from the northward this island shows a triple peak at its north-west end; while its southern part looks like a separate island, saddle-shaped. From the eastward the island appears of uniform height. The southern peak is 730 feet high, and the northern one 560 feet. On the south-west side there is good anchorage in a depth of 10 fathoms in a gap in the reefs which extend westward from the island, at some places to a distance of half a mile. From the anchorage, Kamanga islets bear W. $\frac{3}{4}$ N.; and the western point of Lagat islet S. $\frac{3}{4}$ W.

Lagat is an island 334 feet high, surrounded by a reef with a narrow passage between it and the reef off the south end of Tara.

Reefs.—A patch of 3 fathoms lies West $1\frac{1}{2}$ miles from the south end of Tara; the depths about the northern end are irregular; a patch of 6 fathoms lies between Tara and Nanga; and a patch of 9 fathoms lies N. $\frac{1}{2}$ W. 8 miles from the northern end of Tara.

Bantak island, 800 feet high, is fairly well cultivated; high rocks lie off its north and south extremes.

Kalanhayaun island, flat topped, and 500 feet high, is connected with Bantak by a reef.

Lubutlubut island, 660 feet high, appears inaccessible; north of it a reef extends to the distance of one mile, with rocks above water. A group of rocks, 380 feet high, lies $1\frac{1}{2}$ miles south of Lubutlubut.

The east coast of **Busuanga** is formed by a range of hills, having an average height of 1,200 feet. The most conspicuous among them, seen from the northward, is a three-headed peak 1,880 feet high. Mount Tundalara, southward of it, 2,152 feet in height, has a smooth summit with a small knob on it, not visible from the northward. Over Kokonongon point there is a conspicuous cone 1,300 feet high.

Minanga bay, south-eastward of Kokonongon point, is blocked by islands and shoals. From Alon-on point, southward of the bay, a bank of coral extends three miles off, with depths of 5 to 10 fathoms, shoaling towards the coast.

Port Borak is reported to be very narrow, but sheltered by the islands Dinaran and Mataya, and to afford anchorage in $2\frac{1}{2}$ to 9 fathoms.

Dinaran island is saddle-shaped, with two peaks about the same height, 550 feet; it is surrounded by a reef, which extends half a mile on all sides, except the western, which is clear. A shoal lies $1\frac{1}{2}$ miles south-eastward, with Mataya island in the middle of it; this shoal is $2\frac{1}{2}$ miles in extent north and south, and almost joins the reef that borders Dinaran island.

Dibatuk island is about 300 feet high. H.M.S. *Flying Fish* anchored in the bay north of Dibatuk in 17 fathoms, with the summit of

Dibatuk bearing S.S.W. $\frac{1}{4}$ W., and a rock off the east point of Busuanga E. $\frac{1}{4}$ S. On entering this bay the vessel passed over a ledge of 4 fathoms, extending half a mile from east point, so narrow that the cutter sounding ahead of the ship missed it.

Koron island is rocky, precipitous, and about 1,200 feet high. Its south end terminates in a sharp point, named Kalis, and is steep-to. About the middle of the eastern coast there is a shoal of sand and coral, covered by $5\frac{1}{2}$ fathoms; and another shoal, of $3\frac{1}{2}$ fathoms, lies midway between Koron and Dibatuk.

Koron passage and **Koron bay** are described in China Sea Directory, Vol. II.

Delian island, situated $3\frac{1}{2}$ miles north-east of Kalis point, is 450 feet high. The shores are steep-to, with the exception of some rocks off its southern end, and a short reef on its north-east side. On the west side there is a white sand beach, with a short spit.

SHOALS EAST AND SOUTH-EAST OF THE KALAMIANES.—**Framjee bank**, on which the British ship *Nerwangee Framjee* is reported to have touched in 1878, was examined by the boats of H.M.S. *Flying Fish*, but nothing less than 5 fathoms was found. From the position of least water the islet Lubutglubut, south-west of Kalanhayaun, bore N.W. $\frac{3}{4}$ N., and the summit of Delian S.W. by W. The bank extends about 3 miles in a south-west and north-east direction, has a general depth over it of 8 to 13 fathoms, and 40 to 50 fathoms around.

Magallanes bank, the southern end of which is $1\frac{1}{2}$ miles N. by E. of Narvaez, is nearly 3 miles in length. From the position of least water, $1\frac{1}{2}$ fathoms, on the northern end, Kalis point bears W. by S. $\frac{1}{4}$ S., distant $12\frac{1}{2}$ miles.

Narvaez bank, with 4 $\frac{1}{2}$ fathoms least water, lies with Kalis point bearing West, distant about 11 miles.

Aguirre bank, E.S.E. 17 miles from Delian island, is $1\frac{1}{2}$ miles in extent; the least water on it is $4\frac{1}{4}$ fathoms.

Areta shoal, of coral and sand, position doubtful, is charted about 8 miles northward of the Kiniluban group, in lat. $11^{\circ} 35' N.$, long. $120^{\circ} 46' E.$ Near this position a depth of 9 fathoms was obtained by the British ship *Areta* in 1863, and of 7 fathoms by the *Monarchy* in 1877.

Panay shoal.—The U.S.S. *Panay*, in May 1901, when about 18 miles S.S.E. $\frac{3}{4}$ E. from the south end of Koron island, with Nangalao island bearing W. by S. $\frac{3}{4}$ S., passed over a reef of sand and coral, about $1\frac{1}{2}$ miles in diameter, the least water found being $6\frac{1}{2}$ fathoms. This reef is situated approximately in lat. $11^{\circ} 33' N.$, long. $120^{\circ} 25' E.$

See chart, No. 2,577 [2,656].

A stump of a tree about 15 inches in diameter projects about 5 feet above water on the southern end of the reef in 9 fathoms.

Alpha shoal, with a depth of 6 fathoms, and 14 fathoms close-to, lies 4 miles E. by N. of the north end of Delian.

Beta shoal, of 6 fathoms, with 20 fathoms close-to, lies 7 miles S. by E. of Delian island.

KABULAUAN ISLANDS are a small group about 12 miles eastward of Linapakan, composed of two islands and several islets. Kabulauan, or Sombrero, is $2\frac{1}{2}$ miles in length, with a hill about 700 feet in height near its north-east point. On the south-west side there is a small bay bordered by a reef, with depths of 4 to 11 fathoms. The north side of the island is foul. On the south side there is a rock which appears to be connected with the island by a reef covered with $2\frac{1}{2}$ fathoms water; at 2 miles west of the island there is a patch of $4\frac{1}{2}$ fathoms.

Nangalao, $4\frac{1}{2}$ miles north-east of Kabulauan, is about 2 miles in length, and rises to a central hill about 500 feet in height. A reef on which the sea breaks extends about one mile northward from the north point; at the distance of 2 miles in the same direction there is a shoal with a depth of 8 fathoms on it. Two islets, joined to the south point by a reef, form a bay with depths of 5 to 11 fathoms.

The channel between Nangalao and Kabulauan has not been sounded; there is an islet in the middle of it.

Kanaron island, lying S.E. $\frac{3}{4}$ E. 13 miles from Kabulauan, is small, about 300 feet high, and bordered on the north side by reefs and rocks to the distance of one mile.

Solitario, 40 feet high, lies 5 miles N.E. $\frac{3}{4}$ E. of Kanaron; and Salimbubuk, 100 feet high, lies 5 miles N.N.W. $\frac{3}{4}$ W. of Kanaron.

SULU SEA.—The space included between Mindoro to the north, and the Sulu archipelago to the south, and having the Philippine islands on the east, and Paláwan on the west, is distinguished by the name of the Sulu sea. Although of great depth, 2,550 fathoms, this sea, which is connected with the China and Celebes sea, and also with the Pacific by San Bernardino and Surigao straits, has a minimum deep sea temperature, of $50\cdot5^{\circ}$, reached invariably at 400 fathoms. As this temperature in the China sea is at the depth of 200 fathoms, in the Celebes at 180 fathoms, and in the Pacific at 230 fathoms, it may be inferred that the Sulu sea is prevented from freely interchanging its waters with those seas by ridges which do not exceed those depths.

Winds.—In the Sulu sea easterly winds with fine weather prevail in October, the N.E. monsoon not being established until November. In January and February the monsoon blows hardest, but not with the force

See charts, Nos. 2,577 [2,656] and 943 [2,645].

experienced in the China seas; it is felt strongest before the openings between Panay and Negros, and Negros and Mindanao. At the end of May S.W. winds begin to blow, and in a month become established, to terminate in October, bringing with them a season made up of rain squalls and tempests, which take place principally in July and August. In September a heavy mist hangs about the coast of Mindanao.

In the Sulu sea the East or N.E. monsoon is not a steady fresh breeze, but is often variable. Near Mindanao the northerly winds never blow fresh, and light changeable winds often displace them for several days. This often occurs at the end of January, and it is considered that the same winds prevail from the Sulu archipelago to Manila.

Cyclones occur occasionally, chiefly at the changes of monsoon, and appear to pass chiefly over the northern part of the sea.

Currents.—During the N.E. monsoon the surface drift is with the wind about three-quarters of a mile an hour. In the southern part of the sea there is generally a north-west or westerly current in the neaps between Sulu and Basilan, and in the tracts thence to Balábac strait. In March and April the current sets mostly to the eastward among the Sulu islands, but it sets to the westward at the same time in the openings of the Philippine islands to the north of Mindanao.

Observations of the currents during the S.W. monsoon are too scanty to afford reliable information, but the stream may be expected generally to set north-easterly at the rate of about one knot an hour, increasing in strength to $1\frac{1}{2}$ or $1\frac{3}{4}$ knots on the eastern side of the Sulu sea, and to trend more easterly in direction as the openings between the larger islands are approached.

Tidal streams.—Two tidal waves enter the Sulu sea and passages between the Philippines archipelago from opposite directions; one from the China sea through the western openings, the other from the Pacific through the eastern straits, viz., San Bernardino, Surigao, and Basilan. These waves meet in the many channels between the southern islands.

The wave from the China sea enters that sea from the Pacific by the wide opening between Formosa and Luzon, and passes from north to south along the western shores of Luzon and Paláwan, and through the Verde island passage, Mindoro strait, Linapakan and Balábac straits.

The Verde island stream, after passing south along the coast of Luzon, and deflecting some of its waters into the bay of Manila, continues along the coast to the southward and eastward as far as Puñas point, where it branches. One stream running to the north-east round Tayabas bay, and north and east of Marinduque, through Mompog strait; reunites with the other branch which passes south-east along the Mindoro coast as far as Dumali point, and then to the eastward, south of Marinduque as far as the

Bondog peninsula, where it meets the flood stream from the Pacific which has passed through San Bernardino strait. In that part of the Verde island channel, near Verde island, between points Puñas and Escarceo, there are violent tide rips and eddies.

The flood stream that enters by Mindoro strait follows the coast of Mindoro, part of it continuing round the coast of that island to the northward to Dumali point, where it meets the stream through Verde island passage. The rest of the stream sets south-easterly and divides at the north-west point of Panay island, one branch flowing along the north coast of Panay past Bulakan point and the Gigantes islands to Bulalaki point, the north extreme of Sebu, where it turns to the southward and meets the stream from the Pacific through Surigao strait, about 6 miles south of Kamotes islands. It also flows into Iloilo strait and Tañon strait, in both of them meeting the flood which has entered from the southward, on the parallels of the north end of Negros, and of Taga point respectively.

The other branch, turning to the southward from the north-west point of Panay, and being joined midway by the stream setting eastward from Cuyos islands (or Linapakan strait) continues coasting Panay and Guimará's islands into Iloilo strait, until it meets the other branch described above. Between the Kalamianes and the north end of Paláwan the flood stream sets south-east and the ebb north-west.

The flood entering by Balábac strait, turning to the N.N.E. along the east coast of Paláwan, spreads itself like a fan over the Sulu and Mindoro seas from north-east to east, forming the easterly stream felt between Cuyos islands and Panay, and also that which sets to the south of Kagayanes, where it is said to meet the stream from Surigao strait (and Sebu sea) approximately on the meridian of Kagayanes.

In the Sibutu passage the flood stream sets to the north-westward; and also in the Sulu archipelago the flood stream sets generally northward and westward, but takes many local directions among the islands, where it also appears to be influenced by the monsoon currents. In the channels between the Sulu islands the tidal streams are strong and irregular, and overrun the times of high and low water by from 2 to 3 hours.

Through Basilan strait the flood stream sets to the westward, and passes up the west coast of Mindanao to the northward until it meets the flood stream from Surigao strait somewhere midway on the coast.

The time of high water of the wave that enters from the China sea seems to be from 10 to 12 hours, and of that which comes from the Pacific through the eastern and northern straits from 6 to 7 hours.

CUYOS ISLANDS.—This group occupies a circular space of about 45 miles diameter, on a bank covered by depths of 14 to 40 fathoms,

See charts, Nos. 2,577 [2,656] and 2,578 [2,648].

with deep and generally clear passages between the islands. The group can be passed on either side, but the route to the eastward is most direct and is generally used in the N.E. monsoon from Mindoro strait to Basilan strait. All the islands, with the exception of Kiminatin, are of volcanic formation.

Kiniluban group, the northernmost of the Cuyos islands, consists of several islands and rocks on a circular reef about 6 miles in diameter. The easternmost and largest island of the group is 981 feet in height. The northern ends of the islands are very abrupt, and terminate in jagged needle-shaped rocks. An opening in the south side of the reef leads to the south-west island, which is sparsely populated, but has a church and school. Anchorage may be found off the opening, on the edge of the reef, in a depth of 10 or 12 fathoms.

White rock, 30 feet in height, lies S.S.E. $3\frac{1}{2}$ miles from the largest of the Kiniluban islands, and has a sand bank with bushes joined to the rock by a breaking ledge, lying half a mile south-west of it; with apparently shallow water for a quarter of a mile further out.

Pamalikan island, low and sandy, covered by bushes, and surrounded by a reef, lies about 4 miles south-westward of the Kiniluban group.

Manamok island, 714 feet in height, precipitous on its eastern side and sloping westward, is surrounded by a reef projecting south-eastward one mile. The western side is cultivated. Pigs, fowls, and cocoanuts have been obtained here.

A bank, with depths of 6 to 10 fathoms, lies 6 miles eastward of Manamok, the extent of which has not been determined.

Islets.—The islets Leon 210 feet, Imaruan 466 feet, and Oko 356 feet in height lie respectively, South $4\frac{1}{2}$ miles, S.E. $\frac{1}{2}$ S. 5 miles, and E.S.E. 9 miles from Manamok; they all appear to be steep-to. A bank with depths of 14 to 19 fathoms, sand, extends 2 miles north-eastward from Leon islet; a depth of 9 fathoms has been obtained one mile north-west of Oko.

Dit island, about $1\frac{1}{2}$ miles in extent, rising in the centre to a peak 860 feet in height, is steep-to except on its south-west side, where a reef appears to extend about half a mile.

A shoal of 6 fathoms has been reported to lie $4\frac{1}{2}$ miles N.N.E. of Dit island, but H.M.S. *Flying Fish* failed to see anything of the shoal when passing over and around the site.

Marakanao, 500 feet in height, is a small island, steep-to, situated 7 miles eastward of Dit island, and is the north-easternmost of the Cuyos group.

Chinaman shoals are two coral patches, each about one mile in extent, and with a depth of 25 fathoms around and between them, lying on the north-eastern edge of the bank. The outer shoal, with a depth of 5 fathoms, lies N.N.E. 5 miles, and the inner patch of 4 fathoms N. $\frac{1}{2}$ E. 3 miles from Marakanao. A depth of 11 fathoms has also been obtained N.E. $\frac{3}{4}$ N., 4 miles of Marakanao.

Shoals, with a depth of 10 fathoms, are charted respectively E. by S. distant 8 miles, and E. $\frac{1}{4}$ S. distant 17 miles from Marakanao island.

Sultan bank, one mile in extent, with a least depth of 7 fathoms and steep-to, lies about N.E. by E. $\frac{3}{4}$ E., distant 23 miles from Marakanao. A depth of 9 fathoms was obtained (1899) about 7 miles north-east of Sultan bank in lat. $11^{\circ} 28\frac{1}{2}'$ N., long. $121^{\circ} 31\frac{1}{2}'$ E.

Agutaya island, 950 feet in height, $3\frac{1}{2}$ miles in length, north-east and south-west, and 2 miles in width, is surrounded by a reef which dries out about half a mile on its western side, and is steep-to. There is a village near the western point, with an estimated population of about 300. H.M.S. *Flying Fish* anchored off the reef on the south-west side of the island in 14 fathoms, with the west extreme of Agutaya in line with the peak of Dit islet.

A group of pointed rocks about 15 feet above high water, lies N. 69° W., $3\frac{1}{2}$ miles from the north extreme of Agutaya; and a group of rocky islets, named Guinlabo, 223 feet high, lies 2 miles southward of the island.

A rock, with a depth of 3 feet, was reported by the British ship, *Belted Will* (1880), to lie S. by E. $\frac{1}{2}$ E., distant 7 miles, from the peak of Agutaya, with Paya islet bearing West. The *Flying Fish* passed over this locality in 1886, but no signs of the rock were seen.

Matarabis islet, 457 feet in height, situated about 10 miles eastward of the south end of Agutaya, appears to be steep-to.

Cuyo island is the most important of the group; its length including Bombon at the northern end rising to a height of 830 feet, and which is joined to it by a low, narrow neck covered with trees, is a little over 7 miles, and its greatest width is 4 miles. The western side is bordered by reefs; a shoal extends about three-quarters of a mile from the south-east point; the eastern side has not been closely examined, but appears to be steep-to. From its shores the island rises gradually to a central peak, named Aguada, elevated 608 feet above the sea.

The town, situated on the western side, containing about 8,500 inhabitants, is well kept, with regular streets of houses raised on piles.

Light.—A *fixed red* light is exhibited from the old tower on the pier, visible at the distance of about 2 miles.

Supplies.—Cuyo is very fertile, and produces cacao, coffee, cotton, maize, rice, cocoanuts, oranges, bananas, and pine-apples; the natives

See charts, Nos. 2,577 [2,656] and 2,578 [2,648].

manufacture piña. Cattle, horses, pigs, and fowls are plentiful; water obtained from wells, and depending on the rains, is scarce and indifferent.

Bisukay is a small island, 386 feet high, close to the south-west part of Cuyo, and affords shelter during the south-west monsoon. The channel between it and Cuyo is very much narrowed by reefs, and only used by small craft. Pandan islet lies $4\frac{1}{2}$ miles west of Bisukay.

Anchorage.—There is good anchorage, on sandy bottom, westward of the town, in a break in the reef. The *Flying Fish* anchored in 7 fathoms, with Aguada peak S. 79° E., Bombon summit N. 54° E., and the islet Silat, seen in the gap between Cuyo and Bisukay, S. 10° W. This is the anchorage used by the monthly steamer from Manila.

Tides.—It is high water, full and change, at Cuyo island, at 11h. 30m.; springs rise 6 feet.

Communication.—A steamer leaves Manila every fourth Wednesday with mails for Kulion, Cuyo, Princessa (Paláwan), Balábac, Sulu, and Samboanga, returning *vice versá* to Manila, completing the round to Manila again in 16 days.

Putik is an islet, 440 feet in height, on the north-west edge of the reef bordering Cuyo island. Indagamy (158 feet) and Bararin (321 feet) are rocky and steep-to. A rock, 10 feet high, lies W. by S., one mile from Indagamy. Kanipo island, about $1\frac{1}{2}$ miles in diameter, and rising to a height of 517 feet in the centre, lies $5\frac{1}{2}$ miles north-west of Putik, on the bank extending in that direction.

Between the islands Cuyo, Kanipo, Bararin, and Bisukay the depths are irregular, and generally under 10 fathoms, with patches of $2\frac{1}{2}$ to $4\frac{1}{2}$ fathoms in places. These patches only show when looked down upon from a height, or when the light is favourable. One of these shoals, a patch of $4\frac{1}{2}$ fathoms, lies on the eastern side of a 7-fathoms bank, and in the fairway to Cuyo road, with Aguada peak bearing E. by S. at a distance of $2\frac{1}{2}$ miles from the shore.

Siparay islet, lying 9 miles N.N.E. of Cuyo, is small, rugged, and has a remarkable pinnacle rock on its south side; the *Flying Fish* anchored south-west of the islet in a depth of 10 fathoms. Takbubuk, 3 miles south-westward of Siparay, also small, is smooth and bushy.

Tagauayan, nearly 3 miles in length north-west and south-east, consists of two islands united at low water by a ledge; they lie 9 miles E.N.E. from the north end of Cuyo, and are the easternmost islands of the group.

Kokoro, a small islet lying 7 miles eastward of the north end of Cuyo, is bordered by a narrow reef, and rises to a double mound near its

See chart, No. 2,578 [2,648], with plan of Cuyo.

south side, off which it is steep-to. The islet is inhabited, and under cultivation.

Paya (*see par. below*), Patunga 455 feet, Pamitinan, Lubik 478 feet, and Kauayan 230 feet need not be specially described; they are small and steep-to.

Tabak, a group of rocks, 8 feet above water, with a shoal that breaks one cable north-east of it, is situated westward of the above islets; there are depths of 20 fathoms all round these rocks at the distance of half a mile.

Paya (there is another islet of this name 21 miles north-eastward), the westernmost islet of the Cuyos group, 90 feet high, and composed of basalt, is steep-sided, and has depths of 20 fathoms all round it at the distance of half a mile.

South and south-west of Cuyo islands are several islets: Imalaguan 303 feet, Silat, Kapnoyan 449 feet, Malkatop, and Pangatatan, which need not be described in detail; they are all steep-to. Kapnoyan, 7 miles south-west of Cuyo island, is the only one of these inhabited.

Kiminatin, 6 miles west of Kapnoyan, composed of lime-stone, and rising abruptly from a depth of 30 fathoms, is steep and almost inaccessible, the sides being underworn to a height of 14 feet above the sea. Kiminatin-chico, one mile westward, is surrounded by reef, with a patch of $4\frac{1}{2}$ fathoms off its south-east part.

Santa Filomena shoals are three patches of 2, 3, and $3\frac{1}{2}$ fathoms respectively, with deep water between them, situated from 5 to 7 miles south-westward of Kiminatin; these shoals are the outer dangers of the Cuyos group in this direction.

Between the Filomena shoals and Kapnoyan, at the distance of 4 and 5 miles respectively from Kapnoyan, lie two other shoals, Pacheco and Ramon; the former with a least depth of 3 fathoms, and Ramon with a coral head of $1\frac{1}{2}$ fathoms.

WHITE ROCK, situated S. $\frac{1}{2}$ W. $24\frac{1}{2}$ miles from Cuyo peak, is 24 feet above high water, and has a white head from bird-droppings; it is steep-to on its south and east sides, but a shoal with a depth of 6 fathoms extends off W.N.W. to a distance of one mile, then increasing suddenly to 56 fathoms.

Queen of the Seas bank, an 8-fathoms patch, was discovered in 1868 by Captain Smiley, of the ship *Queen of the Seas*. The bottom was distinctly seen and the bank appeared to be $1\frac{1}{2}$ to 2 miles in diameter. It is charted in lat. $10^{\circ} 25' N.$, long. $120^{\circ} 29' E.$

SOMBRERO ROCK, situated about midway between the south-west end of Panay and Tagaayan, one of the Cuyos islands,

See chart, No. 2,578 [2,648].

shows as two black rocks of the same height (about 10 feet), each appearing to be larger than a big boat. From it mount Aguada in Cuyo bears N. 77° W., and the east tangent of Tagauayan N. 51° W.

KAGAYAN ISLANDS and REEFS.—The Kagayan islands and reefs lying south-westward of Panay are, together with the adjacent Nicholson and Sultana banks, 31 miles in length from N.N.E. and S.S.W., and about 12 miles in extreme breadth; the islands lie at the southern extremity, on the point of an extensive reef, very steep-to, the depth of water at one cable distance from the reef being over 100 fathoms. The islands are fringed by a coral reef westward and southward, but are bold-to on the east side, where landing is practicable. The largest island, Kagayan, 285 feet in height, is, including Boomboong, $6\frac{1}{2}$ miles in length in a N.E. by N. and opposite direction, and 2 miles in breadth; it is thickly wooded. On the southern side there is a village with a fort and church, but the reef which extends nearly a mile to the southward of the village is too steep to afford anchorage; nor is there any anchorage near the neighbouring islands Kagayançillo and Dondonay. Apparently there is a boat passage inside the reef from the village into the lagoon, and the *Samarang* in 1846 found a northern entrance to the lagoon which would admit vessels of 12 feet draught.

The reef extends 8 miles to the northward of Boomboong, and about the same distance to the north-east, including the small, sandy island of Anuling, 40 feet in height. The western and northern sides of this dangerous reef have rocky heads showing above water, which mark it in the day-time.

Manukan islet, on a detached reef north-eastward of Dondonay, has coconut trees on it. The *Flying Fish* anchored on the tail of the reef that stretches westward from the north end of the islet in a depth of 7 fathoms, coral, with her stern in deep water.

Supplies.—The *Samarang* obtained cattle, hogs, poultry, and coconuts at a reasonable price, but the island does not afford good water.

Nicholson banks.—The southern end of these banks is about 3 miles north-eastward of Anuling; they extend northward about 8 miles with a breadth of 2 miles, and consist of several patches with depths of 3 to 7 fathoms, between which there is deep water.

Sultana bank.—The southern end of this bank, which is separated from Nicholson banks by a passage 2 miles in width, in which the depths are 16 to 20 fathoms, is 11 miles N. by E. of Anuling island, and extends northward 7 miles; the northern end being in lat. $10^{\circ} 1' N.$ and long. $121^{\circ} 23' E.$ The width of the bank is about one mile, the ridge having patches of $2\frac{1}{2}$ and 3 fathoms with deep water between.

See chart, No. 2,578 [2,648].

Both Sultana and Nicholson banks are very steep-to on their western sides, with depths of 100 fathoms at the distance of less than half a mile, but they slope gradually eastward, where the 100-fathoms contour-line is 6 miles from the shallow ridge.

Kalusa, a small inhabited island, thickly covered with cocoanut trees 60 feet high, lies W. by N. $\frac{1}{4}$ N. 10 miles from the south point of Kagayan island. It is fringed by a coral reef north and north-west, but is steep-to on the east side, where landing is practicable, though difficult, in ships' boats, as there is but little depth over the reef.

KAVILLI and SANDY ISLANDS, with their outlying reefs, extend $8\frac{1}{2}$ miles in a N.E. by E. and opposite direction, with a deep channel $1\frac{1}{2}$ miles wide between; they lie about 30 miles south-west of Kagayan.

Kavilli or Kaueli island, the north-eastern of the two coral islands, 124 feet in height and covered with trees, is about three-quarters of a mile in length; it is surrounded by a reef which extends $2\frac{1}{2}$ miles in a N.E. by E. and opposite direction.

Sandy island.—The south-western island is low, and stands on a reef $4\frac{1}{2}$ miles in length, with detached sand cays to the southward and westward of it.

As these islands are steep-to on all sides, and the lead gives no warning, mariners should be cautious when navigating in their vicinity, especially at night.

TUB BATAHA.—This dangerous line of reefs, in two parts, consists of small islets, sand cays, and large boulders, all connected by sand ridges, and fringed with steep-to coral reefs, running north-east and south-west for a distance of about 16 miles.

The north-east islet, which is the highest, is about 20 feet above the sea, with verdure in the centre, and lies in lat. $8^{\circ} 53\frac{1}{4}'$ N. and long. $120^{\circ} 0\frac{3}{4}'$ E.

The south-west islet is about 15 feet above the sea, with the trunk of a large embedded tree on its north-east side. Apparently a channel exists through the reef about 5 miles north of the south-west islet, but it has not been examined. Both of these islets teem with sea birds, which fly a long distance from the reef. As a complete examination of the Tub Bataha reef has not yet been made, the seaman when navigating in this vicinity cannot be too cautious, the lead giving little or no warning.

Temerario rock is shown on the chart in lat. $8^{\circ} 48'$ N., long. $120^{\circ} 5\frac{1}{2}'$ E., and a reef in lat. $8^{\circ} 45'$ N., long. $119^{\circ} 58'$ E. These positions have not been examined.

See chart, No. 2,587 [2,648].

Jessie Beazley reef, 13 miles N.W. by W. from the northern islet of Tub Bataha, is about 6 cables in length, and is awash at low water springs for the whole of its length; there are a few scattered heads of coral on it, the highest of which, a small pyramidal-shaped rock about 4 feet high, lies at its eastern extreme. Its position, determined in 1889 by H.M.S. *Rambler*, is in lat. $9^{\circ} 2' N.$, long. $119^{\circ} 49' E.$

The original position assigned to this reef in 1865 by the *Jessie Beazley* has not been examined, and is still retained on the chart, awaiting further information; it is shown in lat. $9^{\circ} 6' N.$, long. $120^{\circ} 4' E.$

Nicholson reef was placed on the Admiralty charts in 1865–1867 as in lat. $8^{\circ} 51\frac{1}{2}' N.$, long. $119^{\circ} 43' E.$ This position was crossed over by the *Rambler* in 1889 without any sign of shoal water being observed, and no bottom at 1,079 fathoms was obtained close to it. It may, therefore, be assumed that this danger does not exist in that position, but for the present it is retained on the Admiralty charts in lat. $8^{\circ} 51\frac{1}{2}' N.$, long. $119^{\circ} 39' E.$ (position doubtful).

Rosalia reef, upon which a Spanish schooner was reported to have been lost in 1867, in the assigned position lat. $8^{\circ} 53' N.$, long. $119^{\circ} 6' E.$, has been expunged from the Admiralty charts, but as this sea has been imperfectly examined, the danger on which the *Rosalia* was lost may yet be found elsewhere in this neighbourhood.

This reef was unsuccessfully searched for by H.M.S. *Egeria* in 1891, under favourable conditions, when many deep-sea soundings were taken over a considerable area round the above position, without any indications of shoal water being found.

Current.—During the above search in March 1891 a current set in a W.N.W. direction about half a knot an hour.

South tub Bataha.—This reef was supposed to exist in lat. $8^{\circ} 4' N.$, long. $119^{\circ} 50' E.$; H.M.S. *Nassau* tried for soundings there, finding no bottom with 180 fathoms. Six miles W. by N. of this position bottom was obtained in 1,878 fathoms, pale yellow sand. As it was a clear day, and a good look-out was kept from the masthead, there is no doubt this shoal has been misplaced on the charts, or probably does not exist.

Mæander reef, discovered by H.M.S. *Mæander* in 1849, is a sand cay, about 180 yards in extent, and 6 feet high, with a large stump of drift wood on it. The cay is frequented by large numbers of sea birds, and is surrounded by a fringing reef steep-to on all sides. Its position, determined by the *Rambler* in 1899, is lat. $8^{\circ} 7' N.$, long. $119^{\circ} 19' E.$

Bankoran island, in lat. $7^{\circ} 57' N.$, long. $118^{\circ} 40' E.$, about half a mile in extent, is flat and overgrown with trees, the tops of which are 140 feet above the sea; it forms a good landmark. It is steep-to south-

eastward, but a reef extends from the island about half a mile northward, and $1\frac{1}{4}$ miles to the north-west. These reefs are steep-to.

Moyune shoal.—The master of the *s.s. Moyune*, 1897, reported that his vessel struck on a rock with 26 feet water, situated approximately in lat. $8^{\circ} 6' N.$, long. $118^{\circ} 6\frac{1}{2}' E.$ Not seen, November 1901, by U.S.S. *General Alava*, which vessel passed $1\frac{1}{4}$ miles from this position.

ST. MICHAEL ISLANDS consist of four islets, situated about 40 miles northward of Kagayan Sulu; the largest, Bankawan, three-quarters of a mile in length, rises to a peak 123 feet high at the north-east end, which is nearly separated from the rest of the islet.

A reef extends $1\frac{1}{4}$ miles north-westward from Bankawan, upon which there is a small coral islet, also sand cays and large boulders. Bankawan is steep-to south-eastward.

Manuk Manukan is the larger of the other two islets of this group, which stand upon a reef $1\frac{1}{4}$ miles in length lying about $5\frac{3}{4}$ miles W.S.W. from the north-east point of Bankawan; it is thinly covered with trees, the tops of which are 32 feet above the sea.

The remaining small coral islet, 20 feet in height, lies half a mile southward of Manuk Manukan; there are large lumps of coral on the reef which show at low water. •

Shoal ground extends north-westward from Manuk Manukan reef, and there is a patch of $2\frac{1}{4}$ fathoms at the distance of $2\frac{1}{4}$ miles from the islet.

West bank, with depths not exceeding 10 fathoms, lying 4 miles westward of Manuk Manukan, is $3\frac{3}{4}$ miles in length N.N.W. and S.S.E.; the least depth found upon it, $6\frac{1}{2}$ fathoms, is near the south end.

South-west bank is an extensive bank situated with its eastern end about 6 miles S.W. $\frac{1}{2}$ S. of Manuk Manukan, whence it extends W.N.W. nearly 8 miles; the least depth, 9 fathoms, was found at its south-east extreme. The depths are fairly regular, 9 to 15 fathoms, coral and sand; the bottom can be clearly seen.

Java reef.—This dangerous reef, about $1\frac{1}{4}$ miles in diameter within the 5-fathoms limit, with a depth of $2\frac{1}{2}$ fathoms upon it, lies N.N.E. $\frac{1}{4}$ E., about 5 miles from the peak of Bankawan. It is marked by discoloured water, and there are strong tide rippings round the shoal ground.

A good clearing mark, if working on its parallel to the northward and eastward, is not to open the small islet north of Bankawan, to the westward of that island.

Valparaiso shoal, stated to be about 2 miles in extent, and upon which depths of 6 fathoms were obtained, when the coral bottom was clearly seen, lies 7 or 8 miles north-west of Bankawan islet in lat. $7^{\circ} 52' N.$, long. $118^{\circ} 27' E.$, approximately. The water appeared to be shoaler in a south-west direction.

Memnon shoal, with its centre in lat. $7^{\circ} 28' N.$, long. $118^{\circ} 25' E.$, is situated nearly in the middle of the channel between St. Michael islands and the shoals northward of Kinapusan island; it rises suddenly from very deep water, and is within the 100-fathoms contour-line, 3 miles in length east and west, $1\frac{1}{2}$ miles in width, with a least depth of 8 fathoms, the bottom being live coral with patches of sand.

H.M.S. *Egeria*, 1891, found that heavy tide rips marked the north-eastern edge of the shoal, which otherwise did not show.

Current.—While the *Egeria* was at anchor on the bank, during spring tides, the current set between S.S.W. and N.N.W. with a maximum rate of 1.2 knots per hour, the flood setting north-westward.

Viola reef, a coral patch with a depth of 4 feet at low-water spring tides, on which the Spanish vessel of that name struck and remained for several hours, is reported as lying in lat. $7^{\circ} 50' N.$, long. $117^{\circ} 41' E.$ This locality was searched by H.M.S. *Nassau* in 1872, when no indication of shoal water was found. A danger is charted 4 miles further north; this was not seen by the U.S.S. *General Alava*, November 1901, on that vessel passing $1\frac{1}{4}$ miles from its given position.

The KAGAYAN SULU GROUP, in the south-western part of the Sulu sea, belongs to the United States of America, and includes the island of Kagayan Sulu, and the two Muligi islands south-westward of it, with Kinapusan, Pomelikan, Bintut, Bohan, and Mandan to the north. Kagayan Sulu is the only island inhabited, the others being resorted to but for temporary purposes, such as turtle catching.

Kagayan Sulu, the largest of the group, about 8 miles in length east and west and 5 miles in width, is (with the exception of the north-west and south-east points, which are steep-to) fringed by a coral reef extending in some places nearly three-quarters of a mile from the shore; this reef dries in patches at low water, leaving channels for canoes between the dry parts of the reef and the coast of the island.

In the interior of the island there are ranges of hills, attaining a height of 1,105 feet on the east side, and sloping gradually to the sea.

Kagayan Sulu appears thinly populated; the soil and climate are suitable for the cultivation of tobacco, sugar-cane, hemp-palm, yams, bananas, and a variety of fruits and vegetables, but the natives are indolent, and depend chiefly for their subsistence on fish and rice imported from Paláwan, for which they exchange cocoanuts and coconut oil.

Supplies.—There are small horses and bullocks on the island; the latter with a few fowls constitute the only live stock, for which exorbitant prices are demanded.

Water may be obtained at half tide from a spring at the landing place near the south-west anchorage, and also at the watering place inside Jiwata lake on the south side of the island.

See chart, No. 967 [2,650], and plan No. 929 [2,599].

Anchorage.—The best anchorage during the north-east monsoon is on the west side of the island, in a depth of from 9 to 11 fathoms, sand and coral; with Tanjong Tavo Tavo bearing N. $\frac{1}{4}$ W., distant about $1\frac{1}{4}$ miles, and a remarkable tree on the south-west point bearing S.E. by E. $\frac{3}{4}$ E. Nearer Tanjong Tavo Tavo, and inshore of the above position, the bottom is very uneven, with patches of 3 to 5 fathoms only.

During this monsoon a swell sets in occasionally round Tanjong Tavo Tavo, causing an unpleasant rolling motion, and interrupting the communication with the shore, the sea breaking along the entire edge of the reef.

There is anchorage on the south side of the island off the remarkable crater basins, in a depth of 10 fathoms, sand, with Tanjong Tando-tao, the south-east point, bearing E. by N., and Green islet, at the entrance of the western crater, N.W. $\frac{3}{4}$ N., distant about one mile.

The best anchorage on the north side is in a depth of 18 fathoms, with Lapun Lapun island bearing N.E. by E., and Ton Kanutyajan point S. by W.

Tides.—At Kagayan Sulu, during the north-east monsoon, it is high water, full and change, at 6h. 10m.; springs rise 6 feet. The tides are irregular and uncertain, the tidal stream being scarcely perceptible.

Kinapusan, two-thirds of a mile in length E.N.E. and W.N.W., and 311 feet in height, is the northernmost of the Kagayan Sulu group; it is surrounded by a coral reef, which on the south side extends nearly one-third of a mile from the shore.

To the north and east of the island the water is deep, but on the south and west sides the 20-fathoms contour-line of soundings is distant nearly 2 miles from the shore.

Fair anchorage will be found on the bank off the south-west side of the island, about half a mile from the shore, in depths of from 7 to 10 fathoms, coral and sand, with Kinapusan summit bearing about N.E. $\frac{1}{4}$ N.

North-east bank, the 10-fathoms limit of which includes a circular space of about one mile in diameter, and with only 4 fathoms near the middle of it on the shoalest part, lies with its centre N.E. by E. distant about 3 miles from Kinapusan; the shoal is of coral and sand, with deep water between it and the island.

This bank is not steep-to, as the depths decrease regularly from 20 fathoms to 5 fathoms, forming a fair anchorage or stopping place on either edge of the shoal. Tanjong Tavo Tavo in line with the west point of Bohan S. by W. $\frac{3}{4}$ W. clears the bank to the eastward, and Pomelikan kept just open of Tanjong Tavo Tavo clears it to the westward.

North-west bank, the nearer end of the 4-fathoms patch of which is N.W. $\frac{1}{2}$ W. $3\frac{1}{4}$ miles from Kinapusan, runs thence in a north-west

direction one mile, and is about one-third of a mile in width; it is of the same character as the North-east bank, but is more steep-to, and vessels should not anchor on it.

The west point of Bohan in line with west point of Pomelikan S.S.E. clears it to the eastward; and the west point of Pomelikan in line with the west end of Mandan bearing S.E. $\frac{3}{4}$ S. clears it to the westward.

Pomelikan, a small island, 180 feet in height, standing on a reef about three-quarters of a mile in length north-east and south-west, lies $2\frac{3}{4}$ miles southward of Kinapusan.

About $1\frac{1}{4}$ miles south of Pomelikan are the two small islets Bintut and Bisu Bintut, which are steep-to; Bintut appears to be formed of dark sandstone.

There are good channels on either side of Pomelikan, but the reefs projecting 3 cables from the south sides of Kinapusan and Pomelikan must be avoided.

Bohan and Mandan, situated about midway between Pomelikan and the north shore of Kagayan Sulu, are connected by a reef dry at low water, and together extend nearly $2\frac{1}{4}$ miles W. $\frac{3}{4}$ N. and E. $\frac{3}{4}$ S.; Mandan, 283 feet in height, is at the eastern end, and the small islet Bisu Bohan, 66 feet in height, on the western point of the reef projecting from Bohan.

There is a good channel, three-quarters of a mile wide, between Bisu Bohan and Bisu Bintut; also between Mandan and Lapun Lapun, a small islet 136 feet in height, almost connected by a reef with the shore of Kagayan Sulu.

All these islands, with the exception of Bintut, are thickly wooded.

Muligi islands.—These two islands are, respectively, 410 and 232 feet in height, the southern and larger island being about half a mile in length north and south, and one-third of a mile in breadth; they lie about 8 miles southward of Tanjong Tavo Tavo, with a clear channel 5 miles in width between them and Kagayan Sulu.

These islands are uninhabited, but the natives resort to them to fish.

A reef extends 2 cables north-eastward from the south Muligi island; the channel, though clear, should not be attempted.

Willcox bank.—H.M.S. *Growler*, 1877, passed over a coral shoal situated N.E. by E. $\frac{1}{4}$ E., 4 miles from North Muligi island, with Tanjong Tavo Tavo bearing N.N.W. $\frac{3}{4}$ W.; the least depth obtained was $6\frac{3}{4}$ fathoms, the bottom being distinctly visible. The shoal is steep-to.

A bank, about half a mile in diameter, with a least depth of 9 fathoms, and 22 fathoms close around, has been reported by H.M.S. *Wanderer* to lie situated with mount Ledan, Kagayan Sulu bearing S.E. by E. $\frac{1}{4}$ E., distant about 30 miles.

Coral shoal.—A coral patch of 3 fathoms has been reported by a German steam vessel as lying 30 miles south-eastward of Kagayan Sulu, in lat. $6^{\circ} 39' N.$, long. $118^{\circ} 57\frac{1}{2}' E.$

Mambahenuhan.—The island Mambahenuhan, situated in lat. $6^{\circ} 33\frac{1}{2}' N.$, long. $118^{\circ} 31\frac{1}{2}' E.$, is 145 feet in height, of brown rock, with brushwood and small trees on the summit.

Pudsey Dawson dangers and Muligi patches are described in chapter IV.

BASILAN STRAIT, open from west to east, separates the south coast of Mindanao from Basilan island; it is 8 miles wide and 24 miles in length. The Santa Cruz islands and banks, situated on the Mindanao side, divide it into two deep channels, both equally navigable: the northern channel, although the narrowest, is generally preferred, as it offers the advantage of anchorage on the coast of Mindanao in the event of a calm, a vessel thus avoiding being carried away by the current.

Caldera bay and port lie to the eastward of the point of that name on the south coast of Mindanao. There is anchorage in the bay in a depth of 5 to 7 fathoms, sand. The inner port of Caldera can only hold four or five vessels of 6 feet draught: the entrance channel to it is but 73 yards wide and 12 feet in depth.

Coast.—From Caldera point the coast runs 7 miles east-south-eastward to Caballo point, west of the town of Samboanga; it consists of sand beaches with some bluffs, and is steep, low, and wooded. Vessels can anchor if necessary in front of the town of San Mateo, on a bank of sand, in a depth of 8 to 15 fathoms; but elsewhere along this part of the coast the bottom is foul and uneven.

SAMBOANGA, the principal town of Mindanao, situated on the south-west extreme of the island, is a town of some importance. It contains a cathedral, fort, and public hospital; the population in 1887 amounted to about 5,400. The settlement dates from the year 1635, when the necessity was recognised of establishing a military post in the centre of the hostile district, as a base of operations against the Moros and pirates.

LIGHT.—From the end of the mole of Samboanga, at the height of 26 feet above the ground and 33 feet above high water, is exhibited a *fixed red* light, visible seaward in clear weather, between the bearings S.S.E. $\frac{1}{4}$ E. and W. $\frac{1}{4}$ S., at a distance of 10 miles.

Anchorage.—The anchorage is not good; the narrow bank that forms it is very steep, and, outside a depth of 12 fathoms, the bottom is hard and uneven, and many ships have lost their anchors there. An excellent mark for the edge of the bank (immediately in front of the town) is the extremity of Tiktavun island in line with Mariki point; outside this

See chart, No. 961 [2,617].

line the water is deep; when upon it the soundings vary from 10 to 13 fathoms, whilst inside it the water shoals rapidly. A good berth is in 10 fathoms, with the lighthouse N. by W., and the south-west extremity of Tiktavun island in line with Mariki point E. by S. $\frac{1}{2}$ S.

Vessels intending to remain at Samboanga more than 24 hours should moor, as it is almost impossible to keep a clear anchor owing to the strong tide and frequent calms. It is advisable to run the cable out with the head inshore, letting go the second anchor in 7 fathoms; under these directions the vessel would not ground, or, even if she swung stern in, be endangered, as the currents and eddies have an off-shore set, and in weighing the inshore anchor, which should be first lifted, the current will only cause the vessel to ride along-shore.

This road is very much exposed to the gales from west and south-west; a heavy sea sets in with these gales, and is increased when the flood stream makes against the wind. Four ships at one time were totally wrecked by a sudden and heavy south-west gale at this anchorage, the cables having either parted or the anchors dragged.

On the first appearance of a south-westerly gale vessels now slip from Samboanga, and if possible run inside Tiktavun island, to the anchorage off Vilanvilan island, which is in 7 fathoms, mud, and affords good holding ground. The approach of these storms is generally foretold by the coast of Basilan being hidden by masses of flying clouds, and the Sangboy islands being lost to view; and if at the same time it should be cloudy, dark, and threatening to the north-west, bad weather is certain, the wind beginning generally to blow from the north-west, and backing until it settles from the south-west. The cause appears to be a typhoon passing to the northward.

During the north-east monsoon the road is sheltered and the water smooth.

Supplies.—Provisions can be obtained at Samboanga at a moderate price; it is necessary to order them the day before to ensure the supply. Meat and poultry, especially, are cheap.

Water can be procured from the stream that runs through the town, but as during the day the natives wash themselves and their clothes throughout its course several miles inland, it is necessary to obtain it early in the morning before they begin. It should also be filtered to free it from any vegetable matter and earth, especially after heavy rain.

Coal.—No coal is stored at Samboanga.

Mails.—There are regular and frequent steamers to Manila: once a fortnight *riá* Sulu and Paláwan, and once a fortnight *riá* Hoilo.

Telegraph cable.—A submarine cable is laid between Samboanga and Sulu. Another cable from Samboanga to Illana bay is connected by

See chart, No. 961 [2,617].

wire over-land with Lintogo, and thence with the island of Negros and the general telegraphic system. *See* p. 30.

Tides.—At Samboanga there are generally two tides in the lunar day; but at equinoctial quarterings, and when the moon has high declination, there is but one tide. The time of high water at full and change is 6h. 54m., and springs rise 4 feet. The same phenomenon is observed here as in the China sea, viz., the highest tide follows the moon's superior transit when she has southern declination, and the inferior transit when she has northern declination. *See* p. 569.

In Basilan strait the tide streams follow the direction of the channel, and near the islands and shoals they follow the edge of the reefs; the flood stream setting to the westward and the ebb to the eastward, with a velocity of 2 to 3 knots at neaps, and 5 to 6 knots at springs. The streams have been observed, however, to set in the reverse way in the months of November and December; and sometimes to set in the same direction for 24 hours, generally from west to east, although there have been two high tides and two low tides on the same day. With these exceptional cases the turn of the stream in Samboanga takes place with slight difference at the hours of high and low water.

The turn of the tide takes place later in the strait than at Samboanga. The change begins first on the coast of Mindanao, then in the strait, and finally on the coast of Basilan.

Winds.—In the vicinity of Samboanga the winds which prevail during the different months of the year are: in January, from east and north-east, with clear weather; in February, March, and April, the same winds with occasional breezes of short duration from north-west. In May and June it blows from south-east, and is variable; but in June there are squalls, and at the end of the month fresh breezes from the south-west. In July, August, and September the wind is from south-west with more or less force, and much rain and foul weather; when a gale occurs it generally does not last more than three or four days. In November and December it blows from the north and north-east, and then the monsoon becomes steady.

Throughout the year, when the seasonal wind is not strong, the land breeze blows during the night, sometimes freshly.

Santa Cruz bank and islands.—This coral bank, the northern edge of which is distant $1\frac{1}{2}$ miles from the coast of Mindanao, extends 8 miles in a direction parallel to the coast with a general width of 2 miles. The shallowest water, one foot to 4 fathoms, is distributed in patches along the outline, leaving passages to the interior of the bank, the depth over which ranges from 6 to 12 fathoms.

See chart, No. 961 [2,617].

Santa Cruz or Great island, on the eastern part of the bank, is nearly $1\frac{1}{2}$ miles in length, and 9 cables in maximum width; it is low, wooded, and surrounded by a narrow reef with 6 to 8 fathoms water at the edge.

Little Santa Cruz island, also low and wooded, lies on the northern edge, north-west of the larger island. It is 8 cables in length east and west, and $1\frac{1}{3}$ cables wide, and each end is prolonged by a reef which dries at low water springs, to the distance of half a mile; shoal water of 2 fathoms extending from the western reef to a distance of $1\frac{1}{2}$ miles from the island.

The Great bank extends to $4\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. of Great island, but the most dangerous part is W. $\frac{1}{2}$ S. of the middle of the island, where there is less than 2 feet water, on a continuation of a line from half way between the fort and cemetery of Samboanga to the eastern end of the small island. Two shoals of 2 and $2\frac{1}{2}$ fathoms lie respectively N. by W. and N.E. about three-quarters of a mile from the eastern point of Great island. President shoal, with depths of $2\frac{1}{2}$ to $3\frac{3}{4}$ fathoms, extends from three-quarters of a mile S.W. to one mile S.E. $\frac{1}{2}$ S. of the point; a detached patch of $4\frac{1}{2}$ fathoms lies E. by S. $\frac{1}{4}$ S. $1\frac{1}{2}$ miles from the same point.

Clearing marks.—The light on the mole bearing N.N.W. $\frac{1}{2}$ W. clears the eastern part of this shoal in 6 fathoms, and the light bearing E. $\frac{1}{4}$ N. clears the northern part of Little bank. Caldera point, bearing N. by W., clears the western part of Great bank in 5 fathoms. The northern side of Little Santa Cruz island bearing W. by N. clears the patches north-east of Great island in 6 fathoms.

Shoal.—A shoal, with a depth of less than 4 fathoms, was reported, 1899, to exist near the middle of Basilan strait, with the east point of Santa Cruz island bearing N. by E., distant $3\frac{1}{4}$ miles, in lat. $6^{\circ} 48\frac{3}{4}'$ N., long. $122^{\circ} 3\frac{1}{4}'$ E., approximately.

COAST.—From Samboanga the coast runs $2\frac{1}{2}$ miles E.S.E. to Mariki point, and thence about E.N.E. towards port Masiugluk; depths of 4 fathoms extend half a mile south-east from Mariki point.

Tiktavun island, $2\frac{1}{2}$ miles in extent E.N.E. and W.S.W., is low and wooded. A reef, with depths less than 4 fathoms, extends one-third of a mile south-westward and a quarter of a mile southward from the island; to the north-eastward, shallow water with less than 2 fathoms extends half a mile, continuing, with depths less than 5 fathoms, to the distance of $1\frac{1}{2}$ miles in that direction. Tiktavun is separated from the coast by a channel half a mile wide and 10 fathoms deep, affording good anchorage. A reef of sand and coral 4 cables in length and 50 yards wide

extends in a N.W. by W. direction from about the centre part of the north side of Tiktavun, towards the middle of the channel, and is generally marked by tide rips. The extremity of the reef is distant 3 cables N.N.W. of the most prominent north-western point of Tiktavun.

Masingluk river and anchorage.—Northward of Tiktavun channel, at about 4 miles eastward of Mariki point, a narrow inlet runs up $2\frac{1}{2}$ miles to the W.N.W. with several rivers flowing into it. The island Vilanvilan divides this inlet into two arms, the southernmost of which, $3\frac{3}{4}$ fathoms in depth, is navigable, and the outlet of the Masingluk river. The anchorage is in mid-channel between Vilanvilan and the south-western Sakol island in 6 to 12 fathoms, completely sheltered from wind and sea, and vessels take refuge here during the south-west monsoon.

Tides.—The flood stream sets south-westward and the ebb to the north-east at the same hours as at Samboanga.

Sakol island, lying north-east of Tiktavun, is separated from Mindanao by a navigable channel, partly obstructed in the northern end by coral banks, with passages about 3 cables in width and 7 fathoms deep on either side, between the banks and the coasts of Sakol and Mindanao. The north-eastern part of Sakol rises to a height of 755 feet; a narrow reef of coral fringes the whole of the island.

A coral shoal, with a depth of $1\frac{1}{2}$ fathoms, lies with the north point of Sakol and Tulnalutan islands in line E. $\frac{1}{2}$ S. at the distance of $1\frac{1}{2}$ miles from the former.

Roldan shoal, lying 2 miles N.N.E. of the north-east part of Sakol, is small, with a least depth of $1\frac{1}{2}$ fathoms, and depths of 5 to 11 fathoms around it.

Tulnalutan is a small island 269 feet in height, lying $3\frac{1}{2}$ miles eastward of the east end of Sakol.

Samar shoal (Angosto), situated E. by N. $\frac{3}{4}$ N. 4 miles from the peak of Tulnalutan, of sand and coral, is half a mile in diameter, with $2\frac{1}{4}$ fathoms least water on it. From the shoalest part the north point of Tulnalutan is in line with the south hill of Sakol, and Matanaal point is one degree open westward of Lanhil island.

Three-fathoms bank is a small shoal of sand and rock, covered by $2\frac{1}{2}$ fathoms water, lying E.N.E. 11 miles from Tulnalutan island.

Sinonog is a small, low island lying $2\frac{1}{2}$ miles eastward of the south-east part of Sakol; it is surrounded by a reef which extends a third of a mile east-north-east, with depths of 9 to 17 fathoms at the edge.

Malanipa island, $1\frac{3}{4}$ miles in length and 394 feet high, situated $3\frac{1}{4}$ miles south of the south-east end of Sakol, lies on the northern side of

the eastern entry of Basilan strait, and has on its eastern coast a small islet surrounded by a reef.

From the west side of Malanipa a bank of fine sand covered by depths of $1\frac{1}{2}$ to 9 fathoms extends $4\frac{3}{4}$ miles to the westward, and is generally about half a mile in width; its north-west end, in $5\frac{1}{2}$ fathoms, lies $1\frac{1}{2}$ miles E.S.E. from the east end of Tiktavun island.

Coco island, situated 4 miles from the coast of Basilan, is one mile long north-west and south-east, 489 feet high, and wooded; the shore reef surrounding it to the distance of about one cable is steep-to. A small islet lies a third of a mile north-west of it.

Sibago island, $7\frac{1}{2}$ miles E. $\frac{1}{2}$ N. of Coco island, is $1\frac{1}{4}$ miles in length north-west and south-east, and three-quarters of a mile in width; a hill on the eastern side rises to a height of 735 feet, but the coast is low.

Lanhil island, $1\frac{1}{2}$ miles north-west of Sibago is $1\frac{1}{3}$ miles in length E.N.E. and W.N.W., and 558 feet in height, with a low shore terminating to the eastward in a reef which dries out for about a quarter of a mile. These two islands seen in certain directions appear as one, saddle-shaped; there are no outlying dangers, and the channel that separates them is clear.

See chart, No. 961 [2,617].

CHAPTER III.

SULU ARCHIPELAGO.

 VARIATION IN 1902.

Basilan strait - - 1° 20' E. | Sibutu passage - - 1° 40' E.

THE SULU ARCHIPELAGO consists of a long chain of islands extending more than 180 miles from the south-west end of Mindanao, to the north-eastern extremity of Borneo, and includes over 150 islands of various sizes. It is divided into three principal groups:— that of Basilan to the eastward; Sulu, from which the name is derived, in the centre; and Tawi Tawi to the westward. Besides these, there are smaller groups, the description of which is included in that of the three larger groups.

BASILAN GROUP.— **Basilan island**, which, with the south-west end of Mindanao, forms the strait of Basilan, is the largest and principal of the group; it is 32 miles in length east and west, and 20 miles in breadth. The island is thickly wooded, and is traversed by high mountain ranges which are frequently enveloped in clouds. The highest peak, lying somewhat to the southward of the centre, attains a height of 3,348 feet. The shores of the island, which are low and wooded on nearly all sides, are girt by a belt of sand and coral debris from 50 to 100 yards wide. This belt is sometimes covered at high tides, and forms mangrove swamps.

There are many rivers, but they are of small extent: their mouths are wide and can be entered by boats at high water, but a short distance up the width contracts until the river becomes a mere rivulet, flowing among stones. Good watering places do not exist, as fallen trees intercept the passage of boats.

Navigation round the island presents no difficulties: the water is clear, and the bottom can be seen at a depth of 8 to 10 fathoms; as the weather is generally fine, vessels can anchor anywhere round the coast on coral bottom.

The inhabitants of Basilan, a scanty population, are of the same race, and speak the same language as the other inhabitants of the Sulu islands; that is a language partaking more of the Philippine than the Malay character, and much intermixed with the Bisaya, one of the most prevailing languages of the Philippine archipelago.

See chart, No. 928 [2,614].

PORT ISABELA is on the north-west side of Basilan island. The roadstead is between the islands Malamaui and Lampinigan, and offers good anchorage in a depth of 6 to 16 fathoms, mud. Port Isabela is in the channel between Malamaui island and the main island, and formerly contained the southern Spanish naval station and arsenal; it is an excellent harbour, accessible to vessels of all sizes.

Malamaui island is 538 feet high, and thickly wooded. The timber is considered to be superior to any found in the neighbourhood, and is well adapted for spars and for building; it consists of molavi, poon, palo maria or bitanhal, and mangrove.

Lampinigan is about 200 feet high, with two remarkable trees on the summit.

Dangers.—Pamelukan bank, the shallowest part of which having depths of $2\frac{1}{4}$ to 5 fathoms, lies 2 miles westward of Malamaui, and $2\frac{1}{2}$ miles N.E. of the summit of Lampinigan: the remainder of the bank has depths of 8 to 17 fathoms.

A bank lying north-westward of Lampinigan stretches east and west for 4 miles, and has two patches of $4\frac{1}{4}$ fathoms on it, situated respectively N. by W. $\frac{1}{2}$ W. $1\frac{3}{4}$ miles, and N.W. by W. $\frac{1}{4}$ W. 2 miles from the summit of Lampinigan. There are besides these, several banks to the north-west of Malamaui, on which the least depths ascertained are 7 to 8 fathoms.

Directions.—The port of Isabela can be entered from the north or south, and there is sufficient depth of water for large vessels. The channel is 4 miles long, and has an average width of $1\frac{1}{2}$ cables. The mangroves on each side grow to the water's edge; the reef at the southern entrance is marked by three beacons. The beacons formerly at the north-eastern entrance have been removed, and are temporarily replaced by buoys of bamboo. A bamboo buoy has also been placed, in a depth of $4\frac{1}{4}$ fathoms, on the edge of the shoal, between Binuán and Tabiauan rivers, but these buoys cannot be relied on. Vessels generally take the entrance which will bring the tide against them in order to avoid turning in the channel.

In entering from the northward the only precaution necessary is to avoid a shoal at the entrance covered by 3 feet water, lying $2\frac{1}{4}$ cables from the Basilan shore, and not to close Malamaui island within the distance of one cable until the channel is entered. Inside the channel the chart shows a shoal of $2\frac{3}{4}$ fathoms at one cable from the Basilan shore; a rock with 2 fathoms on it near Kalut island; another shoal with one fathom on it at the entrance of a creek on the Basilan shore, half a mile from Kalut; and near the middle of the channel on the Basilan side, a shelf of coral level with the surface, having its northern extremity 7 cables N.E. of the

hospital at the entrance of the river Pasahan; but nearly everywhere the shores of the channel can be passed close to the mangroves.

The shoal on which the hospital stands is marked by two beacons, one to the eastward in 3 feet water to indicate the passage between the shoal and the naval station, and the other to the westward in a depth of 16 feet as a guide to vessels manoeuvring. The bottom in Isabela channel is rocky and the anchorage bad.

Western entrance.—Moro island is low, but covered with trees whose tops are 65 feet above the water and visible at a distance of 7 miles. At $1\frac{1}{2}$ cables E.S.E. of this islet there is an extensive reef awash, nearly always covered by driftwood, and marked by the ripple round its edges; part of the sand is always above water, and some mangrove bushes grow there. The reef is marked by three beacons of wooden piles with a cone of canes, one of these is at the western, and one at the eastern edge. The depth of water off the eastern edge of this bank is decreasing towards the Basilan coast. The beacons are not to be depended on.

At $1\frac{1}{2}$ cables W. by S. of Moro island there is a small shoal covered by $2\frac{3}{4}$ fathoms. The channel on either side of the island may be taken, but that between the island and Malamani has the greater depth of water.

The naval establishment of Isabela is on the south side of the channel at the entrance of the river Pasahan; a fort elevated 65 feet above the sea, commanding both entrances of the channel, stands a little distance southward. There is a small store and repairing yard, with workshops for machinery. A wooden hospital stands on piles over the reef at the entrance of Pasahan river. The population of Isabela in 1887 was about 1,100.

Coal.—There are coal sheds capable of storing 2,000 tons on the island of Malamani, opposite the naval establishment, but the supply is uncertain. Coal is taken in from a wooden jetty, alongside which vessels of 20 feet draught can lie, though it is not strong enough for vessels to make fast to; the jetty is in a little bight of the shore out of the force of the tide. There are anchors securely fixed on shore for bow and stern moorings, the shackles being uncovered at half tide (rocks near the anchors being white-washed); and there are piles for breast fastenings. It is better to lay alongside with head to the south-westward, as the stern mooring then will lead more nearly fore and aft.

There is a submerged rock about 70 yards south-westward of the end of the wharf, marked by a bamboo buoy.

Water may be obtained in small quantity at the settlement, but if in the outer road it is more convenient to procure it from the river Kumalarang in San Rafael bay, on the south shore.

Tides.—It is high water, full and change, at 8h. 18m.; springs rise 2 feet. In port Isabela the tides are very irregular, and a single tide a day occurs more often than two tides. The tidal stream does not turn at high and low water; the flood sets to the south-west, and the ebb to the north-east; the rate is generally from $1\frac{1}{2}$ to 2 knots, but is said to have a maximum of about $4\frac{1}{2}$ knots on the ebb and $3\frac{1}{2}$ knots on the flood. See Appendix, p. 569.

Tidal signals.—The following tidal signals are shown (November 1906) from 6 a.m. to 6 p.m. from a flagstaff at port Isabela, and can be seen from either entrance:—

Red cone, point up, at masthead	-	-	High water slack.
„ point down, „	-	-	Low water slack.
Black cone, point up, „	-	-	Strong ebb.
„ „ half-mast	-	-	Ebb.
„ point down, at masthead	-	-	Strong flood.
„ „ half mast	-	-	Flood.

COAST.—The west and south coasts of Basilan are high, wooded, and steep-to, and can be navigated at a distance of one mile with the help of the chart. On the western side, near Pangasahan point, there is a small islet separated from the coast by a channel $1\frac{1}{2}$ cables wide, and 6 fathoms deep, in which small craft can enter.

Malusa bay.—This anchorage, on the west side of Basilan island, is protected by two islands: Great Govenen, conical in shape, and 308 feet high, and Little Govenen, also conical, and 59 feet in height. A small shoal of $3\frac{3}{4}$ fathoms lies N.N.E., distant one cable from Great Govenen. Good anchorage will be found with the northern point of the island immediately north of Teipono bearing W. by S. $\frac{1}{2}$ S., and the peak of Great Govenen S. by E. $\frac{1}{2}$ E. A river enters at the head of the bay, the bar of which dries at low water, but within the bar the depth is 9 feet, and the river is just wide enough for a boat to pull up.

As water is the only supply to be obtained, a small ship, unless well armed, would do well to avoid Malusa bay, the natives having committed frequent acts of piracy.

ISLANDS WEST of MALUSA BAY.—Teingolan, Taikéla Dauan, and the two Langasmate islands are flat and covered by vegetation; the channels between them are clear, except that between Teingolan and Taikéla, where there is a coral shoal of $2\frac{3}{4}$ to $3\frac{1}{4}$ fathoms, which leaves a channel 7 cables in width between the shoal and Taikéla. The chart shows two small shoals of one and $1\frac{1}{2}$ fathoms lying one cable off the north end of Taikéla.

Teipono, lying $1\frac{3}{4}$ miles south-west of Great Govenen, is a low island about half a mile in length; a coral reef with a depth of $1\frac{1}{2}$ fathoms, extends one cable from its south point.

Northward, two-thirds of a mile from Teipono, there is another small, low, wooded island; the chart shows a coral reef projecting to one cable from its northern end, and a detached patch of one fathom at the distance of a cable from its eastern side. The channel between these islands is deep and clear.

Tides.—The maximum rise of tide is 5 feet; the tidal stream in the channel between the coast of Basilan and the islands Teinga Laguit and Teingolan attains a rate of 3 knots an hour at times; the flood stream sets north-westward, and the ebb to the south-east.

SOUTH COAST of BASILAN.—Some small islets border the coast between Malusa bay and Mangal point, the southern extremity of Basilan. Mangal point is low and sandy; Tumajubun point, 6 miles eastward, has a small hill on it. At the distance of one mile south-east of Tumajubun point is the edge of the bank with $6\frac{1}{2}$ fathoms on it, and no bottom with 60 fathoms at less than a cable outside. Kaulungan island off the south-east point of Basilan, is low; it is separated from Basilan by a narrow channel with several small shoals at its northern end. The soundings on its south-east side are very deep, there being upwards of 60 fathoms at the distance of $1\frac{1}{2}$ cables.

Matangal point.—In the large bay between Kaulungan island and Matangal point, the eastern point of Basilan, the depths decrease from 20 to 10 fathoms towards the shore; the bottom is coarse sand and rotten coral, favourable for anchoring upon to wait a tide. The land above the point rises to a mountain elevated 2,126 feet above the sea.

The north-east shore is bold-to. Coco, Sibago and Lanhil islands, lying off it, are described with Basilan strait; see p. 101.

SANGBOY GROUP.—Teinga island, the northernmost of the archipelago, is small, low and wooded, and is fringed by a reef. The bank with depths of 5 to 11 fathoms, on which the group is situated, extends to a distance of about 5 miles E.N.E. of Teinga.

Sangboy islands, or Hare's Ears, are two remarkable islands, 841 and 585 feet in height, and may often be clearly seen when the high land of Basilan is obscured by clouds. The hill of the southern or higher island resembles a cupola, while the land round it is low. A shoal with a depth of 2 fathoms is shown on the chart at the distance of 2 miles S. $\frac{1}{2}$ E. of the southern end of the southern island, and another shoal of $2\frac{3}{4}$ fathoms at $1\frac{1}{2}$ miles E. $\frac{1}{4}$ S. of the same point.

Kalublu and Dassalan are low islands which are said to produce good timber. A shoal with a depth of $2\frac{1}{2}$ fathoms extends 2 miles westward from Kalublu; and Griffin rocks, covered by $1\frac{1}{2}$ fathoms, lie $2\frac{1}{2}$ miles westward of the same island. These rocks do not always break

and should be given a good berth. Besides these dangers, and a patch of 2 fathoms lying E.S.E. 2 miles from the south point of Dassalan, the chart shows many shoal patches about these islands.

Satioldkit islet, and the two rocks Lakit, are on the south-western edge of the Sangboy bank. To the north and north-west of Satioldkit, and up to a distance of 5 miles from it, there are many charted depths of $3\frac{1}{4}$ to $4\frac{3}{4}$ fathoms, and there may be dangers in this locality not yet discovered.

Favorite bank, south-westward of Sangboy bank, has not been sounded out: the *Nassau* in 1871 carried a depth of from 6 to 10 fathoms for 8 miles over it.

Clearing mark.—If bound south, mount Bahu summit, in Sulu island, bearing S. $\frac{3}{4}$ W., crosses the bank in not less than 13 fathoms; the shallower water being about 5 miles to the westward of that line.

Pilas island, lying about 10 miles westward of Basilan, is (together with Tiguilabun, which is an extension of Pilas island southward) $7\frac{1}{2}$ miles in length, north and south, the land being low and flat except at the north end, where the higher of two hills has an elevation of 919 feet. On the east side is the small island of Tagutu.

On the western side there are many small islands and several shoal patches, extending off for about 6 miles from Pilas; between some of these islands there are good anchorages, especially one on the north-west part of Pilas; but a good local pilot is necessary for entering it, particularly if the northern entrance be taken.

Puju bank, extending northward one mile from the northernmost islet has a depth of $1\frac{1}{2}$ fathoms for the greater part of its length, and must be avoided, as also a patch of $3\frac{3}{4}$ fathoms lying three-quarters of a mile N.N.W. $\frac{1}{2}$ W. from the north extreme of Pilas.

Coral patches.—A patch with a depth of 2 fathoms lies S.W. $\frac{1}{4}$ S., distant 3 miles from the south point of Tiguilabun, the extension of Pilas island; and another of the same depth lies S.W. by W. $\frac{1}{2}$ W. $4\frac{3}{4}$ miles from the same point.

Mindoro shoal, or Batu Bolu, of $2\frac{3}{4}$ fathoms, lies situated W. $\frac{1}{4}$ N. distant 10 miles from the south extreme of Tiguilabun.

Takut Pabunuan (included in the Sulu group in the Spanish Derrotero,) is a bank of sand and shells lying with its shallowest part 19 miles W. by N. $\frac{3}{4}$ N. from the western Bolod island, and $16\frac{1}{2}$ miles N. $\frac{1}{4}$ E. of Gujangan island. It is 5 miles in extent from north to south, and about 2 miles in width; with a general depth over it of about 4 fathoms, but in the middle there are patches of $2\frac{3}{4}$ and 2 fathoms.

Halcon rock, or *Wilhelmina* reef, lying 6 miles N.E. by E. $\frac{1}{4}$ E of the 2-fathoms patch on *Takut Pabunuan*, is awash at high water and steep-to.

Pilas channel, between *Pilas* island to the west and *Baluk Baluk* and *Mataja* to the east, has a width of 3 miles and is clear and deep, the least depth being a patch of 9 fathoms in mid-channel, eastward of *Tagutu*. The tidal streams in it attain a velocity of 6 miles at springs, the flood setting north and the ebb south.

Baluk Baluk island rises to a peak, 525 feet in height, at the northern end; the southern part is low.

Mataja island is low, flat, and wooded; it is surrounded by a sandy bank, which at the northern end of the island extends about 4 cables, and terminates at the distance of a mile in a depth of 5 fathoms.

Teinga Laguit and Odel are small, low, and wooded; from *Teinga Laguit* a reef projects 6 cables in a N. by W. direction.

Dauan and *Langasmate* are described among the islands West of *Malusa* bay, *see* p. 105.

Tamuk is about 180 feet high; the channel between it and *Basilan* is clear. The islet *Kankuman*, one mile E.S.E. of *Tamuk*, is clean-to; a shoal with a least depth of 6 fathoms lies one mile south of the islet.

TAPIANTANA GROUP.—*Tapiantana* island, lying $5\frac{1}{2}$ miles southward of the south point of *Basilan*, has on its western side a hill which rises gently to an elevation of 938 feet above the sea; the eastern part is low, and ends in an extensive reef which dries at a distance of nearly $1\frac{1}{2}$ miles to the eastward. The southern edge of the reef is wooded, forming the narrow island *Tolon Pisa*, and is very steep, the chart showing no bottom with 55 fathoms at a distance of one cable from the trees. The island is inhabited.

Bubuan, $1\frac{1}{2}$ miles to the northward, has the same appearance as *Tapiantana* with a hill 794 feet high. In the channel between the two islands there is a shoal with less than one fathom over it.

Salupin and Timbungan are two low, wooded islands on one reef at the eastern edge of the bank on which the group is situated; this bank is very steep, the chart showing no bottom with 60 fathoms at little more than a cable to the eastward of the island.

Bihintinusa is a little low islet, sandy and wooded, lying less than a mile from the south coast of *Basilan*; a bank with a depth of $1\frac{1}{2}$ fathoms extends to a distance of $1\frac{3}{4}$ miles E. by N. from the island into deep water, there being no bottom with 60 fathoms at 2 cables from the tip of the spit.

Lanauan island has two hills on it, 318 and 394 feet in height respectively; a reef projects two-thirds of a mile south-south-eastward from its southern end. The island is inhabited.

Tides.—At Tapiantana it is high water, full and change, at 6h. 3m., rise at springs $7\frac{3}{4}$ feet.

The tidal streams in the channel southward of Tamuk set nearly north-west and south-east, the flood in the former direction; they turn at $4\frac{1}{4}$ hours after high and low water. The tides are greatly influenced by the monsoon; the ebb attains a rate of from 2 to $2\frac{1}{2}$ miles an hour at springs in the south-west monsoon.

SAMALES GROUP.—**Tatalan island**, 387 feet in height, lies 12 miles south-westward of Basilan island, and 4 miles within the edge of the bank of soundings. The passage between Tatalan and Lanauan, called Tapiantana channel, 6 miles wide, is clear of danger; there are several detached banks in it upon which the depths are from 7 to 10 fathoms. With the south-east stream, a line of strong rippings sometimes marks the edge of the bank which falls suddenly into deep water.

Batu Mandi, a rock awash with deep water around it, lies 2 miles W. by S. from the north extreme of Tatalan, and at $3\frac{1}{4}$ miles westward of Batu Mandi there is a narrow bank 2 miles in length north and south, with a least depth of 8 fathoms, sand and rock.

Bolod islands are two small islands of nearly the same appearance; the western Bolod is 643 feet in height, and the eastern 597 feet. A dangerous little patch of flat rock, almost level with the water, lies about half a mile northward of the eastern Bolod, and a shoal of $3\frac{3}{4}$ fathoms extends the distance of a mile south-eastward from it.

A bank of sand and rock, $1\frac{1}{2}$ miles in extent, lies S.W. $\frac{1}{2}$ W., distant 5 miles from the western Bolod.

Takut Sungu, lying S.E. by E. $\frac{1}{4}$ E. 4 miles from the eastern Bolod, is 2 miles in extent in a north-east and south-west direction, nearly the same breadth, and consists of sand, gravel, and rock. Near its south-west extremity are rocks with a depth of one fathom; the bank is steep-to.

Bukutua and **Belauan** are separated by a narrow channel one cable in width and about 10 feet deep. The first of these islands is low, with a hill 157 feet in height at its eastern end. Belauan has a round mountain 1,184 feet high near its centre. At one mile north-east of Belauan are the two islets Dipulut: the easternmost, which is the larger, is 250 feet in height, and is three-quarters of a mile from the edge of the bank. Mamad islet, $1\frac{3}{4}$ miles to the westward of Bukutua, is 118 feet high, and has no dangers beyond the distance of a quarter of a mile from its shore.

The channel between Bukutua and Tatalan is deep, clear, and $2\frac{1}{2}$ miles in width.

Tonkil is a low crescent-shaped island, 12 miles in extreme length east and west, on the south-eastern edge of the great bank; southward of Tonkil, the 100-fathoms contour-line approaches to the distance of about one or two cables from the coast. The passage between Tonkil and Belauan is about 3 miles in width, but a shoal flat extends from the Tonkil shore within the horns of the crescent, upon which there is a depth of $2\frac{3}{4}$ fathoms distant but one mile from Belauan.

Balanguingui islands, consisting of Mamanak, Parol, Tunkalan, Sipak and the principal island Balanguingui, with several islets, are situated 2 miles west of Tonkil. They are coral islands surrounded by reefs, with narrow channels between them only navigable by the light boats of the Moros.

Bangalao, Manungut, and Simisa, are three islands lying westward of Balanguingui; Manungut is 276 feet in height, the other two are low. Takut Suligan is a patch of 3 fathoms lying $1\frac{3}{4}$ miles west of the south-western point of Balanguingui. A shoal of 3 fathoms extends one mile south-west from Bangalao, and one of the same depth projects northward $1\frac{1}{2}$ miles from the same island.

Tidal streams and whirlpools.—Navigation about these islands is dangerous on account of the strong currents and eddies. The master of the *Amy Warwick*, who for many years traded from Singapore to the Eastern Archipelago, found that at times the tides between Sulu island and Balanguingui ran at the rate of 8 knots an hour, with strong eddies and whirlpools. On the flood or north-west stream, the pool is close under Sipak island, and on the ebb it lies close to the south-east of Simisa, and under Bitinan, of the Sulu group.

SULU GROUP.—Sulu island, from which the archipelago is named, is 34 miles in length east and west, and from 3 to 12 miles in breadth. The island is a series of hills and valleys, with good cultivation and park-like scenery; the highest mountain, elevated 2,894 feet above the sea, is near the west end. The coasts, especially the northern, are in general wooded, clean, and steep-to; as are also the islands and islets that border them. They are slightly indented, and form several bays where there is anchorage; the most sheltered and secure in both monsoons being that of Tulian or Dalrymple on the north side.

The **climate** of Sulu, although the island is so near the equator, enjoys a much more even and cooler temperature than that of Mindanao; the nights are sensibly cool. The Sulu islands are seldom, if ever, visited by gales, although strong winds and heavy falls of rain are not uncommon.

See chart, No. 928 [2,614].

The **population** of the Sulu group in 1899 amounted to 17,000, according to the estimate of the Philippine Commission. Amongst these, four distinct races may be distinguished, of which the Guimbanos are the indigenous inhabitants of the island, and the Moros the dominant race, that regulate the commerce and traffic.

Kapual island, situated at the north-east extremity of Sulu island, is circular, about 3 miles in diameter, and 1,066 feet in height on the southern side; it is clean and steep to everywhere, except to the south-west, where it is united to Sulu by a bank of sand with 2 to 4 fathoms over it in places. On this bank is the islet Bulicutin.

The Kapual channel between Kapual and Sulu is deep at the eastern end, but has only $1\frac{3}{4}$ fathoms at the western part.

Goitya shoal, $1\frac{1}{2}$ cables in extent, and with a depth of $1\frac{1}{2}$ fathoms, lies one mile north-west of Kapual.

Bitinan island, lying north-east of Kapual, and separated from it by a clear channel three-quarters of a mile in width, with a depth of 10 fathoms, is $1\frac{1}{2}$ miles in extent and 722 feet in height; it is clean and steep to.

Tides.—In the channel between Bitinan and Kapual the tide runs at the rate of 3 knots an hour.

DALRYMPLE HARBOUR, situated at the eastern end of the north coast of Sulu, and partly formed by the island of Tulian, is the only well-protected harbour in this fertile island. Good anchorage will be found during the north-east monsoon under the lee of Tulian island; the natives report that during this monsoon the wind seldom blows home.

Tulian island, about one mile in length in a N.E. by N. and opposite direction, and 8 cables in width, is steep on the north-west side, attaining a height of 672 feet. To the south and south-west it is bordered by a reef about a cable in width, and in the latter direction a flat with a depth of $3\frac{3}{4}$ fathoms extends $2\frac{1}{2}$ cables from the shore. There is a well on the south-east side of Tulian.

Buol or **Boal** was formerly the largest town in this part of the island of Sulu, but the place was partially destroyed by the Spaniards in 1872.

From Buol the coast trends to the E.S.E., forming a deep bight south of Tulian; the bight then trends E.N.E. to Petley point, and is fronted by a flat and several shoal patches, upon which there are depths of from 2 to 3 fathoms. Westward of Petley point is the large village of Karang-karang.

Dangers.—In the eastern entrance there are two patches of $2\frac{3}{4}$ fathoms, the westernmost of which lies East $8\frac{1}{2}$ cables from Martin bluff in Tulian island, and N. by E. of Karang-karang village. A bank, with depths of $3\frac{1}{4}$ to $4\frac{1}{4}$ fathoms, lies south-eastward distant 2 to 4 cables from

Martin bluff; a patch of 2 fathoms on a bank of $4\frac{3}{4}$ fathoms lies 6 cables S.E. by E. $\frac{1}{4}$ E. of Balseiro point; and in the western entrance there is a 2-fathoms patch lying N. by W. 4 cables from Baverstock point.

Anchorage.—A large vessel should enter Dalrymple harbour from the eastward, rounding the north end of Tulian island and passing about $1\frac{1}{4}$ or $1\frac{1}{2}$ cables from Martin bluff, in order to avoid the shoal ground of $3\frac{1}{2}$ fathoms lying south-eastward of that point. A good berth will be found with Balseiro point bearing W.N.W. distant nearly a quarter of a mile, and Martin bluff N.N.E. $\frac{3}{4}$ E. in a depth of 8 or 9 fathoms.

Tides.—It is high water, full and change, at Dalrymple harbour at 7h. 50m., springs rise 4 feet.

Coast.—From Buol the coast trends westward for 4 miles, and then curving first to the south-westward and afterwards gradually round to the northward, forms a bay $3\frac{1}{2}$ miles across to Tuk-Tuk point. The bay is bordered by a reef, which is steep-to; at half a mile from the reef, with Kaduayan village bearing S.S.W., is Eseo bank, of 2 cables extent, covered by 2 fathoms water, and surrounded by depths of 5 to 7 fathoms. From Tuk-Tuk point the coast trends north-west 3 miles to Igasan point, near which is Bankungan island; from thence westward $8\frac{1}{2}$ miles to Diangappik point, the northern limit of Sulu roadstead, it is clean and steep-to.

The towns Kaduayan, Suok, Bun-bun, and Patikolo, on this coast, offer no resources; the natives are very poor.

Gujangan island, $3\frac{1}{4}$ miles N.W. of Tulian, is small, low, and very steep to; on the eastern side there is an islet obstructed by a shoal.

A rock is reported by the pilots to exist 3 miles north-eastward of Gujangan island in lat. $6^{\circ} 7' N.$, long. $121^{\circ} 18' E.$ approximately.

Bankungan island, of triangular form, and 112 feet in height, is clean and steep-to, except north-westward, where a reef projects $1\frac{1}{2}$ cables, with a rock awash on it. There is a narrow but safe channel with a depth of 7 fathoms between the island and the coast.

Panganaa islet, one mile east of Bankungan, has some rocks close to its southern part; elsewhere it is clean.

SULU ROADSTEAD, between points Diangappik and Belan, is open to the northward and westward, and when the wind blows fresh from the north-west vessels go to Maibun road. The coast is clean and consists of coarse sand; the bottom slopes gently, and the 5-fathoms contour-line is generally distant 2 cables from the shore. A reef about $1\frac{1}{2}$ cables in width, that uncovers in parts at low water, borders the beach before the town, leaving a passage of one foot depth to a lagoon that penetrates to the southward. Two forts command the road.

Anchorage.—The best anchorage is north of the town, in a depth of 13 fathoms, with the south-west angle of fort Afonso XII. bearing S.E., and Belan point S.W.

LIGHT.—From a white octagonal tower on the mole in Sulu harbour at the height of 37 feet above high water, is exhibited a *fixed red* light, visible in clear weather at the distance of 7 miles.

From a post at the outer end of the mole, a *fixed green* light is shown.

Tides.—It is high water, full and change in Sulu roadstead, at 7h. 38m; springs rise 3½ feet. The flood stream sets south-westward, and the ebb to the north-east.

Sulu town.—Hardly a trace of the old native town on piles exists; the modern town consists of three or four streets, planted with rows of banana and cotton trees, and is surrounded by a wall on which are small watch towers. The town is clean and well kept. A substantial stone pier runs out in a northerly direction for about 350 yards from the town, built in the shape of a cross, and makes a very good landing place for boats; there is a depth of about 20 feet at its outer end. The population in 1887 was about 2,500.

Telegraph cable.—A submarine cable is laid between Sulu and Samboanga in Mindanao, thus connecting the island with the general telegraphic system. See page 30.

Imports and exports.—Trade at this place is dull, and is mostly in the hands of Manila men and of Chinamen.

The imports are principally rice, hardware, and cotton goods; exports, pearl-shells, pearls, shark's fin, beche de mer, and a small variety of woods.

There is a pearl oyster bed in the channel between Sulu anchorage and Marongas, giving occupation for 60 or 70 boats.

Supplies.—Small supplies of fresh meat, fish, fruit, and vegetables can be obtained in the market.

At Mubu point the large fair or market is held once a week; cattle, poultry, and vegetables are brought here in abundance for sale.

Water.—There are several wells within the town of Sulu, but the water is not particularly good, and the best is obtained from a spring on the beach at Mubu point, about three-quarters of a mile north-eastward. Its situation is a curious one, the water bubbling up in a strong stream between high and low water mark into a sort of rocky basin.

Coast.—From Belan point the coast trends W.S.W. for 4½ miles to Pugut point, and from there curves towards the south for another 4½ miles as far as Silangan point, the western extremity of Sulu. All this part is

See plan of Sulu roadstead on chart, No. 928 [2,614].

safe to approach, a depth of $4\frac{1}{2}$ to 10 fathoms being found at the edge of the narrow reef that borders the shore.

Takut Buansa, a shoal with a least depth of $3\frac{3}{4}$ fathoms, lies half a mile W.N.W. of Mangalis point, about $2\frac{1}{2}$ miles westward of Belan point; about midway between this shoal and Belan point, at three-quarters of a mile from the shore, there is a small coral patch of 4 fathoms.

Tulian island, lying $1\frac{1}{4}$ miles off Pataluan point, is 208 feet in height and steep-to; the channel inside is clear, but there is a depth of only $4\frac{3}{4}$ fathoms at the distance of 4 cables from the point.

Busson rock, which lies $2\frac{1}{2}$ cables N.W. of Tulian, is covered by a depth of 4 feet, with 19 fathoms close outside it.

Matos shoal, about one mile north of Silangan point and half a mile from the shore, is covered by a depth of 5 fathoms.

ISLANDS NORTH-WEST OF SULU. — These form a group of six large islands, and several small ones, separated from the north-west point of Sulu by a clear channel nearly 3 miles in width, and with a depth of from 15 to 30 fathoms.

Marongas island, 285 feet in height, half a mile south-west of Pangasinan, is separated from it by a channel in which there is a depth of 8 fathoms. Anchorage may be had in 7 to 12 fathoms at the distance of 2 cables from the west coast of this island, but the currents are strong.

Pangasinan is 548 feet high; at three-quarters of a mile north-east of the island there is a bank, one mile in extent, with a depth of $3\frac{3}{4}$ fathoms over it; and at half a mile south of Pangasinan there is a smaller shoal of the same depth.

Hegad island, low and flat, is separated from Pangasinan and Bubuan by safe and deep channels. The little islet Tawi Tawi, one mile west of it, has reef projecting from its east and west ends, but is steep-to on the north and south sides.

Minis island, the north-easternmost of the group; is one mile in extent, and is low, flat, and steep-to.

Bubuan is 498 feet in height; on its south side are two islets of no importance. The channel that separates Bubuan from Kabukan is divided into three passages by the little islet Lahat-lahat and the bank Concas; these passages are about 2 cables wide, and have a depth of $5\frac{1}{2}$ fathoms.

Kabukan is 4 miles in extent east-north-east and west-south-west, about 50 feet in height, and perfectly flat. On the south side it is clean, but the north and west sides are bordered by a reef which extends half a mile to the westward; the eastern part ends in several islets covered by mangroves.

Aguirre bank (Tong-Tong), within the depth of 10 fathoms extends to $2\frac{1}{2}$ miles from the south-west coast of Kabukan, and is 2 miles wide north and south. The shoalest part, with a depth of 4 fathoms, lies about 2 miles from the western extreme of Kabukan.

A patch of 3 fathoms is charted at a distance of 6 miles west-south-west of Kabukan.

Pantokunan, situated $3\frac{1}{2}$ miles north-west of Kabukan, circular in form and about one mile in diameter, is low and flat; it is clean and steep to on the south side, but bordered by a coral reef to the distance of one-third of a mile on its northern side. This island appears to be on the Pangutaran bank, hereafter described, as in the channel between it and Kabukan there is a depth of more than 110 fathoms.

Sulade island, which lies south-west about 7 miles from Bunga point in Sulu island, is very flat, and forms a complete lagoon enclosing an archipelago of islets, with an entrance navigable by boats at high water on the south. On the western extreme are two remarkable trees like fan-palms, which, on approach to the island from north or south appear like the sails of two prahus.

There is anchorage on the west side of Sulade island in from 6 to 10 fathoms, sand, the bottom being even, and the depths decreasing regularly to the shore.

Strong currents prevail, a rate of $3\frac{1}{2}$ knots an hour having been experienced at ordinary tides, running principally to the north-east; it has also been found setting W.N.W. at the rate of $2\frac{1}{2}$ knots.

SOUTH-WEST COAST of SULU.—**Bunga point**, 2 miles south of Silangan point, is surrounded by a reef which extends along the coast from before the town of Bauisa to the northward, as far as the town of Parang to the east. The reef is about half a mile in width and near its edge the depth is 7 to 14 fathoms.

Parang.—The village, consisting of thirty or forty houses in line, is built on piles in the sea, each house being connected with the shore by a separate bridge of palm-stems. H.M.S. *Mosquito* anchored in 8 fathoms about half a mile from the shore, close to some fishing stakes, with mount Temontangis N. 31° E., and Tubingatan point S. 64° E. From this anchorage the water shoaled gradually towards the landing place opposite the east village; on each side of the channel there is a reef with fishing stakes on it.

Batolaki bank is a group of six shoals, lying three-quarters of a mile south-east of Kabalian point, and occupying a space of 7 cables extent, covered by one to 3 fathoms with one rock awash at low water—generally marked by a stake—to the westward: the depth between the shoals is 6 to 7 fathoms.

Clearing marks.—Bunga point open of Tubingatan point, the point west of Kabalian, bearing N.W. $\frac{3}{4}$ W. leads south-west of Batolaki shoals; and mount Mabintin N.E. by E. leads south-east of the group.

MAIBUN BAY is much frequented during the north-east monsoon, but is liable to a heavy swell during the south-west monsoon, which sets in during June. The bay is 8 miles wide between Kabalian point and point Putik, and $2\frac{1}{2}$ miles deep to the northward; at its head are the river and town of Maibun.

The coasts of the bay are bordered by a narrow coral reef, and a depth of 5 fathoms will generally be found at the distance of 2 cables from the shore. The western coast is wooded, with cleared spaces; the towns of Lagassan and Lubang are on this shore. The eastern shore is covered by mangroves;* the town of Punungan lies not far from Putik.

Banks.—Within the bay, and fronting the river, there are two banks, the southernmost of which is always dry, and is named Dry bank; the northernmost dries at half ebb; both banks are marked by fishing stakes. There are, besides, four shoals: Marban bank, with $1\frac{3}{4}$ fathoms least water on it, lies S.E. by E. $\frac{1}{2}$ E., 5 cables from the reef of Dry bank; a smaller shoal of $1\frac{1}{4}$ fathoms lies S.S.E., 5 cables from the same reef; and two patches of $4\frac{1}{2}$ fathoms lie respectively E. $\frac{1}{2}$ S., 7 cables, and E. $\frac{3}{4}$ N., 8 cables, of Dry bank. The depths between the banks and shoals and the shore are from $5\frac{1}{2}$ to 14 fathoms.

Directions for Maibun anchorage.—There are three channels between the shoals into the road, but the navigation is somewhat difficult, owing to the want of leading marks. The easternmost, between Marban bank and the eastern shore of the bay, seems to be the best; it is about half a mile wide, and, with the exception of the $4\frac{1}{2}$ -fathoms shoals above mentioned, is not less than 7 fathoms deep in the middle. Mount Mabintin (the hill 1,614 feet high, north-eastward of Maibun), kept on a N.E. bearing until the northern end of Patian island is just open of the point near Punungan, will lead to the entrance of the eastern channel; then steer in for the town with these marks just open, closing them as the town is neared.

The next best channel is that between Dry bank and Marban bank. If this passage be taken, Dry bank should not be brought to bear westward of North until the $1\frac{3}{4}$ -fathoms patch S.S.E. of it is passed; this bank can generally be distinguished by the fishing stakes on it, and if these should

* Commander W. McCastle, H.M.S. *Curlew*, 1878, remarks:—"There is a spit extending from the eastern shore about 2 miles inside Sirugai point; it runs out more than half a mile with but 6 feet of water on it at low-water." Sirugai point, however, is not marked on the English chart, nor on the Spanish chart, nor is it mentioned in the Spanish Derrotero of 1879.

See plan of Maibun bay on chart, No. 923 [2,614].

not be in place it can be distinguished even at high water by the light colour of the water over it. When this patch bears East a course should be steered to pass between Dry bank and Marban. If unable to make out the position of Marban bank, it can be passed to the southward, bearing in mind that it bears W. by N. of the little hill near Putik point.

The western passage is not recommended, as it is only 2 cables wide between the northern bank and the bank off the mouth of the river; the conspicuous house on the east side of the river mouth brought on with the shoulder on the north of mount Mabintin leads into the western entrance; and, gradually brought on with the summit, leads north-westward of the shoals, to the anchorage off Maibun.

Anchorage.—Vessels can anchor in a depth of 5 to 8 fathoms off the mouth of the river, with Teumabal island bearing South, and Patian island S.E. $\frac{1}{2}$ S. The water runs deep to the bar.

Tides.—In Maibun bay the tides are irregular; it is high water, full and change, at 7h. 30m.; springs rise 4 feet. Inside the banks the stream is insensible, and in the offing the rate is less than a mile an hour. The flood stream sets westward, ebb eastward; both streams over-run the times of high and low water on the shore by about two hours.

Maibun town is the residence of the Sultan of Sulu. The houses are built on piles on the outer edge of the bar, which has only a foot of water on it at low tide. In 1880 trade was carried on between Labúan and the island and rivers of Borneo.

Supplies.—Fresh provisions can be obtained, but are not abundant; vegetables are scarce; fruit is plentiful.

Teumabal island lies south-west $3\frac{1}{2}$ miles from point Putik. It is small, low, and surrounded by a coral reef which projects to the eastward to the distance of a mile.

Patian and **Lumbian** islands are clean and steep-to; in the channel that separates them there is anchorage in a depth of 12 fathoms. A patch of 3 fathoms lies off the south-west point of Lumbian, in the southern approach to the anchorage. The passage between Patian and Teumabal island is clear and deep.

Villamil rock, situated midway between Patian island and Putik point, is surrounded by depths in excess of 14 fathoms.

Tutu bay, eastward of Putik point, is only separated from the bay on the north side of Sulu island by a low isthmus, $2\frac{1}{2}$ miles in width. A narrow steep reef skirts the western shore of the bay, but from the northern, and also from the south-eastern shore between Tutu point and Karangdato point, the reef extends to $1\frac{1}{2}$ miles from the coast. Serantes

shoal, covered by $1\frac{1}{2}$ fathoms, lies three-quarters of a mile from the western shore. The towns Pandanpandang, Karongdong, and Sang, are on the eastern shore.

Anchorage may be had in the bends on the western side of Tutu bay, and in the inlets in the reef on the northern and eastern sides. The bay is sheltered from the southerly winds by Pata island.

Pata island, circular in shape, and about $4\frac{1}{2}$ miles in diameter, rises in the centre to a mountain 1,434 feet in height. The shores are clean and steep-to, except on the eastern side, from which a reef extends 2 miles eastward, having upon it an island almost joined to Pata, and Tankuiki rock near the south-eastern edge.

The small islet Damokan lies 4 cables to the north-west of Pata.

Dong Dong island, in the passage between Pata and Karangdato point, is low, flat, and surrounded by a steep reef. Tambulian, a small round island with a shoal extending to half a mile from its south-east shore, lies three-quarters of a mile north-west of Dong Dong. Anchorage may be had south-west of Tambulian in a depth of 8 fathoms.

Pitogo bay, lying between points Karangdato and Tandikan, has not been closely examined; the shore is bordered by a shoal which is about 3 cables in width on the eastern side of the bay.

The edge of the bank on which the archipelago is situated is close to the shoal to the southward of Tandikan point, and is at the distance of one mile from it, north-east of the point; it is also one mile from Tandu point, the eastern extreme of Sulu.

The towns Higan and Ganon are situated in the bay lying between points Tandikan and Tandu, which is entirely filled up by a shoal extending more than a mile from the shore.

TAPUL GROUP.—This group is situated between the Sulu and Tawi Tawi groups. The population of this group amounts to about 12,300.

Tides.—In the channels between the islands the tidal streams are strong, and overrun the times of high and low water by two to three hours.

Tapul and Bolipongpong (Lugus).—These two fertile and well-cultivated islands lie about 8 to 14 miles southward of Kabalian point in Sulu; both have conical peaks, the former being 1,676 feet, and the latter 955 feet in height. They are apparently clear, except at the north-west end of Bolipongpong, where a reef projects out, and for the reef extending eastward from the island about two miles; the narrow channel between the islands is only fit for boats. At one mile from the south coast of Bolipongpong, the depth is 9 and 10 fathoms, and anchorage may be had in the bight on that side of the island, east of the little islet Gondra, in 8 fathoms.

Kabingaan and **Taluk** are two low flat islands on the same reef, with a lagoon inside between them, on the western side of which is the smaller island Boacoa. Pakia island, close to the west side of Kabingaan is also low, and has a narrow reef projecting $1\frac{3}{4}$ miles to the south-east, with $1\frac{1}{2}$ fathoms on the end of the reef, and 11 fathoms close to off it. There are villages on the islands.

A patch with a least depth of 9 fathoms lies 2 miles northward of Taluk.

SIASSI, the peak of which, 1,673 feet in height, is in lat. $5^{\circ} 32' N.$, long. $120^{\circ} 52' E.$, is about $6\frac{1}{2}$ miles in length, north and south, and $5\frac{1}{4}$ miles wide in an east and west direction.

There are several large villages built on the reefs that fringe the south-west and east coasts, the inhabitants of which carry on the pearl fishery, the pearl oyster being found in great abundance in the vicinity.

An extensive reef projects 5 miles eastward from the south-east part of Siassi, on the eastern and southern shores of which are numerous low, thickly wooded, and uninhabited islands; they are very low, the sea in some places washing through them at high water.

Off Bas-Bas point, the south extreme of Siassi, the reef only extends to a quarter of a mile, and at the distance of half a mile from the shore there is no bottom at 66 fathoms.

South-west of Siassi the reef runs out for about 3 miles, and is separated from the reef extending south from Lapak by a narrow channel, which varies in width from half to one cable, and is only fit for small craft.

Tara island lies on the reef to the north of Siassi, and is about $1\frac{1}{2}$ miles long in an east and west direction; it is very low on the west side, but about 110 feet high on the east. North of this is Tinkalan rock, 8 feet above high-water mark, which in the distance resembles a canoe under sail; this rock is near the edge of the reef, and lies about N.E., $1\frac{1}{2}$ miles from the north end of Siassi.

The channel between Tara and Siassi is 12 fathoms deep, and $2\frac{1}{2}$ cables in width; but there are shoals at both ends of it.

Shoals.—Northward of Siassi island, in the fairway of the channel between that island and Bolipongpong (Lugus) island, three shoals are known to exist, viz.:—

Takut Sungu, one mile in length, east and west, and one third of a mile in width, with a least depth of $2\frac{3}{4}$ fathoms, sand and coral, lies with Tinkalan rock, bearing E. by S., and the north point of Siassi S.E. distant about 2 miles.

Takut Langon.—About three-quarters of a mile westward of Takut Sungu is the eastern end of Takut Langon, with a depth of 6 fathoms; thence the shoal takes a W.N.W. direction for $1\frac{1}{4}$ miles with a

breadth of half a mile, having the depth of $4\frac{1}{2}$ fathoms on the shoalest part, near its western extremity. From this position the north-east point of Lapak island is in line with a remarkable tree in the town of Siassi; and Selun island bears S.W. by W. distant 4 miles. There is deep water between Takut Sungu and Langon.

Bank.—At $1\frac{1}{2}$ miles W.S.W. of Takut Langon, and 2 miles N.E. $\frac{3}{4}$ E. of Selun island, there is a bank of 6 fathoms, about half a mile in extent.

Takut Kadiajan.—Eastward of Siassi island, and of the reef which trends S.S.E. from Tara island, a shoal with two heads of 2 and $2\frac{1}{2}$ fathoms, has been found on the bank which extends about $1\frac{1}{2}$ miles from the reef.

Between this shoal and North Gusun reef northward of Laminusa island, is a channel half a mile broad with a depth of from 6 to 11 fathoms.

During the N.E. monsoon heavy tide rips are seen near this bank.

Between Takut Kadiajan and Siassi island are several small shoals, and a reef named Bambagan, which partly dries, is situated half a mile from the shore.

Between Takut Kadiajan and Bambagan is the northern channel to Laminusa anchorage, with depth of 11 fathoms, sand.

Inshore of Bambagan reef there is a good anchorage in from $3\frac{1}{2}$ to $5\frac{1}{2}$ fathoms.

Laminusa island, which lies three-quarters of a mile eastward of the east point of Siassi is low, and covered with mangroves; on the north-western part there is a village and cocoanut plantation. Eastward of the island a reef dries out to the distance of a quarter of a mile, and from there the water deepens gradually to the eastward for $1\frac{1}{2}$ miles to a depth of 10 fathoms; at 2 miles from Laminusa in this direction there is no bottom with 55 fathoms.

The channel which separates Laminusa from Siassi island is divided into two passages by a bank of sand and coral, named Gusun, which dries at low water, and can at all times be seen distinctly. The passage between the bank and Laminusa is clear, but narrow; and winds more than that to the westward of Gusun which is navigable by vessels of all sizes.

Laminusa anchorage, between Laminusa and the reefs adjacent to the east point of Siassi, is of considerable extent and well sheltered, with a depth of 6 to 10 fathoms, good holding ground; the reef, which uncovers in parts at low water, is steep-to, but cannot be easily distinguished, and must be approached with caution.

Tides.—The tidal stream is very strong at springs; the flood stream sets from east to west and then north through the channel—the ebb from north to south and then east; springs rise 6 feet.

Directions for entering Laminusa anchorage.—Tara island should be passed half a mile to the eastward in order to clear the reef off Siassi;

See plan of Laminusa on chart, No. 928 [2,614].

then a course S. 29° E. will lead in, with a depth of 6 to 11 fathoms, until west of the head of the reef north of Laminusa; a course should then be steered for Punuan island in line with the eastern point of Siassi, which will clear the reefs off Laminusa. The $3\frac{1}{4}$ -fathoms patch a quarter of a mile westward of North Gusan reef must be avoided. Punuan island can easily be recognised, it being a truncated cone 289 feet high.

The channel between Laminusa and the Siassi reef should only be used in fair weather, and with a favourable light for seeing the edges of the reefs; it is not recommended for large vessels.

Port Siassi.—On the west coast of Siassi, in the northern part of the channel that separates that island from Lapak, there is a military station, and a sheltered port of 3 cables extent and moderate depth. The Settlement consists of a fort, hospital, and about 20 houses.

Light.—At the end of the wharf at Siassi, a *fixed red* light is exhibited, which is visible in clear weather at a distance of 2 miles.

Entrance, Eastern side.—Tolan point, on the north-west coast of Siassi island, and 2 miles northward of the Settlement, is low and wooded; from it and Bus-Bus point, further south, a coral reef extends westward for a quarter of a mile, and uncovers at low water. Northward and westward of this reef, at the distance of 2 cables from it, are two detached coral patches with depths of 2 fathoms; and beyond them a bank of $4\frac{1}{2}$ fathoms extends westward to the distance of half a mile from the point. A detached bank of 2 cables' extent covered by $4\frac{1}{4}$ fathoms water, lies 6 cables to the north-west of Tolan point. Within the channel two banks of $3\frac{1}{2}$ and $4\frac{1}{2}$ fathoms respectively lie off the mouth of the river Bus-Bus, midway between Tolan point and the settlement of Siassi; the northernmost bank, which is the shoaler, extends half-way across the channel. A small patch of $4\frac{1}{2}$ fathoms lies $3\frac{1}{2}$ cables north of the fort, and 2 cables from the shore. The general depths in the channel are from 4 to 12 fathoms.

Western side.—Luangat point, the northernmost point of Lapak island, is of rock and steep-to, and may easily be recognised by a small hill inland close to it. Busluk point, half a mile westward of Luangat point, is readily distinguished from it by being formed of huge rocks, and also by its being quite separated from the mountain.

Alikan point lies E.S.E. one mile from Luangat point; a shoal of $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms water extends 3 cables N. by W. of this point; and another of $3\frac{1}{2}$ fathoms 2 cables to the eastward. South of Alikan point the Lapak shore is clean as far as a conspicuous beach opposite the settlement of Siassi.

Anchorage.—The reefs in the anchorage between Siassi and Lapak islands are marked by small buoys. The best berth is opposite the

See chart, No. 928 [2,614], and plan on No. 2,576 [2,605].

settlement, where there is a landing jetty; if intending to remain, vessels should moor.

Supplies.—Fowls, fruit, and fish can be procured in small quantities; water can be obtained from wells at a short distance from the jetty.

Tides.—At Siassi it is high water, full and change, at 5h. 54m.; springs rise 8 feet. During the south-west monsoon the highest tide is in the morning; during the north-east monsoon the evening tide is the highest. The flood stream within the channel sets to the north; the tides run at the rate of 2 to 4 knots an hour; they are affected by strong winds.

Tidal signals.—Upon the approach of steamers towards the channel leading to port Siassi, a tidal signal is made at the end of the wharf:—A green flag indicates that the stream is running to the South. A red flag indicates that the stream is running to the North.

Directions for Port Siassi.—Coming from the northward, when at the distance of one mile from the entrance of the channel, the *gorro* should be brought to bear S.E., and steered for on that course until points Busluk and Luangat are in line bearing W. by S.; the extremity of the shoal ground off Tolan point is on a continuation of this line, and must be passed with caution. From this position a S.S.E. course will lead between the shoals that extend from Siassi island, and the $3\frac{1}{4}$ -fathoms bank off the coast of Lapak; this bank can also be cleared by keeping the end of the mole at Siassi open of the beach on the north-east point of Lapak. When the flagstaff on Siassi fort bears S. $\frac{1}{2}$ E. (which will be when the islet Selun becomes shut in by Lapak) a mid-channel course should be taken; and when abreast of the most salient point of sand on Lapak, that coast, which is the safest, should be approached, until off the settlement. Sailing vessels should await a fair wind for entering.

The southern entrance, but half a cable in width, is fit only for small craft of light draught; the bottom is foul with large rocks, and the tide runs at the rate of 4 to 6 knots. For entering, a vessel in the offing should approach the passage between the reefs, steering for the most conspicuous house in the village of Manubol, on a N.N.W. $\frac{1}{2}$ W. course. At low water, and in clear weather, the direction of the channel can be seen; but at high water, and in dull weather, the passage should not be attempted without a pilot, and only in case of necessity. In the northern part, where the channel divides into two passages, the westernmost, which is the deeper and wider, should be taken; then, passing near the islet Taktagan, the channel between Siassi and Lapak will be entered.

Lapak, lying three-quarters of a mile westward of Siassi, is about 5 miles in a N.E. by N. and opposite direction, and 3 miles in width. It has a conspicuous peak at the north extremity, 1,010 feet in height, and another near the southern end, 1,306 feet high, with a great dip between

See chart, No. 928 [2,614], and plan on No. 2,576 [2,605].

them, so that in the distance on a south-east bearing Lapak appears as two islands. A reef extends $3\frac{1}{4}$ miles south-eastward from this island, and nearly joins the reef projecting south-westward from Siassi.

One-third of a mile from the south-west point of Lapak there is a dangerous patch of rock, with a depth of 8 fathoms between it and the shore.

Manubol.—The island of Manubol near the south end of the Lapak reef has a large fishing village on its north-eastern side.

Anchorage.—There is good anchorage in depths of from 7 to 12 fathoms, sand and coral, south-westward of the small island, Pandami, on the west coast of Lapak, and immediately off the village.

Supplies of bullocks, goats, and fowls may be obtained at Lapak at a moderate rate; vegetables are scarce. About 50 yards from the beach there is a well; it affords, however, but little water.

Selun, a small island covered with trees, lying $2\frac{3}{4}$ miles north-west of Lapak, is about a quarter of a mile long, 157 feet in height, and steep-to, with a clear channel between it and Lapak.

TapaaH, a low island south-west of Lapak, of semi-circular form with the concave side to the westward, is very narrow in the middle, being in some places only half a cable across; it stands on a coral reef that is dry at low water, with a small sand cay at the north end and an extensive one on the south side, curved towards the coast of Lapak.

The channel between TapaaH and Lapak islands is about $1\frac{1}{2}$ miles wide, and entering from the south, Selun just open of Lapak, clears the reef off the south-east point of TapaaH; steering to the northward with this mark on until the south point of Lapak bears E.N.E., a course of N.W. by W. leads through the channel to the northward of TapaaH, but it crosses a bank with a depth of $4\frac{1}{2}$ fathoms on its southern end.

TapaaH passage, which is formed by TapaaH and Lapak to the eastward, and Bubuan and Maniakolat to the westward, is about 6 miles wide at its narrowest part, viz., between Maglumba, a small islet 123 feet high, off Maniakolat, and the north-west side of TapaaH. This passage is clear for a steamer, and would be convenient for a sailing ship, as the tidal streams running with a strength of 3 to 5 knots an hour, make fairly through it, and in calms or light winds a vessel could always anchor to await the change of tide.

Crest of Wave shoal is in the fairway of the TapaaH passage, and the shoalest part, of $4\frac{1}{2}$ fathoms, lies about N.E. $\frac{1}{4}$ E. $4\frac{3}{4}$ miles from the little conical islet Parangaan, on the south-west side of the passage. It is composed of coral and sand, and is about $1\frac{1}{2}$ miles in extent within the depth of 10 fathoms; it can generally be discerned by the tide rippings round the edge of the shallow water, and by the discoloration of the sea.

Tapaan shoal, a patch of coral and sand lying nearly midway between Tapaan and Bubuan, is about one mile in extent, with a depth of 6 fathoms.

TAWI TAWI GROUP.—Parangaan is a conical islet, 90 feet high, clothed with light grass; about $3\frac{1}{2}$ cables westward of the island is a small flat-topped islet, 14 feet high, with a narrow 7-fathoms channel between the dry reef extending eastward from it and Parangaan.

Maniakolat and Parangaan are connected by a bank upon which are depths of 6 to 9 fathoms. Maniakolat is thickly wooded, $1\frac{1}{2}$ miles in length north and south, and three-quarters of a mile wide; the peak of the island, 773 feet in height, shows from nearly every direction as a perfect cone. A small islet, 60 feet high, and wooded, lies nearly 4 cables west of the south-west part of Maniakolat.

Maglumba, situated about a mile E. by N. from the north-east point of Maniakolat is an islet, about $1\frac{1}{2}$ cables in length and 123 feet high; the southern side of it is foul to the distance of about 2 cables. There is a deep channel to the westward of this islet.

Bubuan island is about $2\frac{1}{2}$ miles long north-west and south-east, and 2 miles in width, with a 3-fathoms channel, half a mile wide, between it and Maniakolat. Bubuan is covered with trees, and from the highest peak (457 feet) a chain of hills extends to the eastward, terminating at the north point.

On the west side of Bubuan is a shallow lagoon, with a bar nearly dry at low water; in this lagoon the numerous fishing prahus engaged dredging for pearl oysters south and east of this island, seek protection from stress of weather.

Bank.—A bank extending 7 miles in a N. by W. $\frac{1}{2}$ W. and opposite direction, covered generally by depths of 4 to 9 fathoms, but with rocks awash at high water near the middle of its eastern edge, and two patches of $1\frac{1}{2}$ fathoms on its southern part, is situated north-west of Maniakolat. The rocks awash lie W. by N. $\frac{1}{4}$ N. from the north extreme of Maniakolat, and S.W. $\frac{3}{4}$ W., distant about $2\frac{1}{2}$ miles from Parangaan islet.

Kakataan island, though low and flat, is covered with trees, the tops of which are 105 feet above the sea; it is about a mile long in a north-west and south-east direction, with a reef that dries extending 3 cables from its northern end. There is a coral patch of $3\frac{1}{2}$ fathoms at the distance of one mile to the southward of Kakataan, on a bank of 7 fathoms extending $2\frac{3}{4}$ miles in that direction.

A detached bank, with a depth of 6 fathoms, lies 2 miles south-westward of this island; and there are patches of 7 and 9 fathoms between the bank and Sigboyé island.

Sigboyé island, 778 feet in height, and thickly wooded to the summit, lies about S.W. by S. 6 miles from Kakataan. It is steep-to on the north side, but a rock with $2\frac{1}{2}$ fathoms over it lies $3\frac{1}{2}$ cables to the southward off the centre part of the island.

Tambagaan island, the north-east point of which is W.S.W. $1\frac{1}{2}$ miles from the west point of Sigboyé, is about 3 miles long and $1\frac{1}{2}$ miles wide, with a conical green peak 726 feet in height near its east extreme. There is a deep channel with strong overfalls between Sigboyé and Tambagaan.

Off the south point of this island there are two small rocks or islets, and at the distance of 2 miles some patches covered by $3\frac{1}{2}$ and $4\frac{1}{2}$ fathoms of water; the rock nearest the island, 25 feet in height, is surrounded by reefs, the other rock, 8 feet high, lies half a mile S.W. by W. $\frac{1}{4}$ W. from the former.

Simaluk and Kuad Basang.—The east point of Simaluk, which is the larger of these two islands, lies 4 miles north-west of Tambagaan island; these islands are similar in shape, being like horse-shoes, with the concave sides to the eastward; the indentation in Simaluk is nearly filled up with numerous small islets.

Both are surrounded by a fringe reef, and between the two is a shallow coral patch three-quarters of a mile long north and south, on which the sea breaks heavily during the north-east monsoon. There is anchorage both east and west of this patch, but it is not recommended, as the anchorage south of Tambagaan, only 6 miles distant, is better.

There are no houses on either island, but the natives visit them in great numbers, the fishing ground inside the reefs being so good; at the approach of a boat or a steamer the natives take to the woods, and it is difficult to hold communication or obtain information from them.

Magpeos island, 4 miles southward of Bubuan, is an almost perfect cone, 418 feet high; a reef extends to the distance of about 3 cables E.N.E. from the island, with a rock awash at the end of it.

Tagao island, lying S. by W. about a mile from Magpeos island, has four small peaks, the highest of which, on the north-west extreme of the island, is elevated 270 above the sea. There is a deep channel between this island and Magpeos.

A rock, with $1\frac{1}{2}$ fathoms on it, lies one-third of a mile south-east of Tagao, and the island should be given a berth of a mile when passing it to the eastward.

Pandanán and Tankolaluan are two small coral islands lying to the westward of Tagao, they are covered with trees; the former is 90 feet and the latter 107 feet in height.

At the distance of 2 cables west of Tankolaluan there is a small rock that seldom covers, on which the sea breaks heavily with strong north-easterly winds.

KINAPURAN GROUP, lying about 10 miles southward of Babuan island, consists of the three low, densely wooded, coral islands Tabawan, Bintoulán, and Kinapuran. Tabawan has several small islands and islets on the reef extending $1\frac{1}{4}$ miles south from it, and is separated from Bintoulán and Kinapuran, which latter islands lie on the same reef, by a 5-fathoms channel. There is also a clear channel between Tabawan and Loran which lies to the westward of it.

The reef off Kinapuran extends $1\frac{1}{2}$ miles in an E. by S. direction from that island, and near the outer edge there is a sand cay that dries 3 feet at low water.

As the reefs to the southward of these islands are steep-to, and the lead consequently gives no warning, care should be taken when navigating in this vicinity. The tides here are also strong and irregular. Two miles south of the western islet of Tabawan, in the corner of the reef, is a patch of rock that seldom covers except at very high tides.

Anchorage.—There is anchorage on the north side of Tabawan with the west extreme of the village of Tahing Tahing, bearing about S.S.E., three-quarters of a mile off shore.

The tides here are regular, and not very strong.

Supplies.—The island of Tabawan is thickly populated, but Bintoulán and Kinapuran are only resorted to for fishing, this being the chief occupation of the natives, and upon which they depend principally for the means of subsistence. Numerous boats also leave Tabawan in the season for the pearl oyster banks. No provisions are to be obtained here except fish and cocoanuts, in small quantities.

As a rule the natives take to the jungle on a steamer appearing, a Spanish squadron having burnt their town down for acts of piracy; but during the *Nassau's* intercourse with them they appeared harmless and inoffensive.

Loran island, lying $2\frac{1}{2}$ miles westward of Tabawan, is $1\frac{1}{2}$ miles in length north-west and south-east, about 3 cables wide, and on the north-west side is 158 feet in height.

The northern point of Loran island is steep-to, but the remaining shores are fringed by coral reefs to the distance of from about 2 cables on the east and north-west sides to 6 cables on the south and south-west sides. On this reef, to the southward, are several small islets, and the little island of Manote.

South Ubian island, about three-quarters of a mile south-west of Loran, is triangular in shape, with the apex to the north-west; it is the most thickly populated of this group.

The island is surrounded by a coral reef extending from it to a distance of three-quarters of a mile on the east side, having several little islets upon it, the highest of which dries 8 feet at low water.

It is reported that the natives of this island are still pirates; the village on the north-east side was destroyed by H.M.S. *Dwarf* in 1869, for piracy committed on an English schooner. On the approach of H.M.S. *Nassau*, the inhabitants disappeared.

There is no passage, except for boats or small craft, between South Ubian and Loran. Anchorage in a depth of from 7 to 10 fathoms may be taken northward of these islands.

THE TABUAN GROUP, about $1\frac{1}{2}$ miles westward of South Ubian island consists of a number of rocks and small islets, the largest of which, Tabuan, is inhabited.

The group lies on the eastern edge of Bukutkut bank, a large coral reef which stretches away north-westward 5 miles from Tabuan island with the rocks Lijat-Lijat on the north-west extreme, and one mile southward, with numerous sand cays on it. A detached patch, with a depth of one fathom, lies westward of Tabuan island, with a deep channel half a mile wide between it and Bukutkut bank.

Pasegan Samal is a small low coral island 5 miles W.N.W. of the north point of South Ubian, covered with trees, the highest of which is 90 feet above the sea. It is fringed with a reef extending northward and eastward to the distance of 4 cables from the shore, with depths of 3 to 6 fathoms at the edge. At 6 cables north-west of the island is a narrow bank nearly a mile in length, with a depth of $3\frac{1}{4}$ fathoms.

Pasegan Guimba, (not named on chart,) situated $1\frac{1}{2}$ miles west of Pasegan Samal, is very similar to it. North-west and south-west of this island are banks, with depths respectively of 2 and $2\frac{3}{4}$ fathoms; that to the south-east nearly joins the Lijat-Lijat rocks on the point of Bukutkut bank. The channel that separates the Pasegan islands is deep between the edges of the reefs.

Anchorage.—There is fair anchorage off the north end of South Ubian island in from 7 to 12 fathoms, sand, and on the bank east of Pandanan island in from 8 to 10 fathoms, sand. H.M.S. *Nassau* also anchored east of Kakataan in 10 fathoms, sand; and on the mid-channel bank between Kakataan and Bubuan islands, both to the south-west and north of the rocks awash, in depths of 7 to 8 fathoms, sand and shells.

Tides.—Between Sulade and Kakataan islands the flood tide runs to the north-west and the ebb north-east, at a moderate rate in the open channel, but very strong round the islands.

In the channels on either side of the mid-channel bank eastward of Kakataan, the flood stream sets nearly north and the ebb about south, at the rate of from one to 3 knots.

Off Pandanan the streams set about N.N.W. and S.S.E., and at the anchorage northward of South Ubian the flood runs north-west and the ebb south-east, at the rate of from one to 2 knots.

It is high water, full and change, at South Ubian island at 6h. 15m.; springs rise 5 feet.

South of Ubian, and between that island and the Tabuan group on Bukutkut bank, the tide runs at the rate of fully 4 knots at springs round the edges of the reefs, where its greatest strength is felt.

Supplies.—No supplies are to be obtained from the islands of the Tawi Tawi group. Wood may be cut on any of them for steaming purposes.

Vessels navigating these waters must be very cautious, as the natives are treacherous and not to be depended on.

TAWI TAWI island, the principal of the group, is about 30 miles in length N.E. by E. and S.W. by W., and 14 miles in maximum width, at its eastern end. A range of mountains traverses its entire length; to the north-east, mount Bujimba rises to a height of 897 feet; mount Batua, eastward of port Dos Amigos, is elevated 1,283 feet; and near the centre of the island is mount Dromedary, which culminates in four peaks, the highest of them with an altitude of 1,941 feet.

The little isles that surround Tawi Tawi are sparsely inhabited, and have been generally regarded as refuges for pirates.

The north coast of the island has few outlying dangers, and affords several sheltered anchorages with convenient depths of water. The north-east coast is bordered by a chain of islands of moderate height which present anchorages for vessels passing between them. The south coast is also bordered by islands and reefs which extend from 10 to 15 miles to the south and south-west, leaving deep passages between them to the bays on the coast. The south-west coast, or south coast of Sanga Sanga islands, is clean and steep-to.

ISLANDS OFF the EAST COAST of TAWI TAWI.
—**Bas Bas** island is low and covered with mangroves, with a hill about the middle of the western side 248 feet high. The island is steep-to and clean, except to the north-east, where there are three rocks at the distance of 4 cables from the shore; while off the south point rocks extend more than a mile south-eastward with several heads above water.

Panjumajan island lies one mile east of Bas Bas, and has on its north-west extremity a hill 99 feet in height; it is surrounded by a narrow bank of sand, with a rock on a small shoal, and two great rocks (named Pamakalan and Pamagbaran) situated respectively 2 and 4 cables from the south coast. The bank extends three-quarters of a mile from the north-east side of Panjumajan, and apparently continues almost to Tambagaan island with but one fathom increase of depth.

There are several rocks near the middle of the channel between Panjumajan and the south end of Bas Bas.

Bas Bas channel, between Bas Bas island to the eastward, and the north-east extremity of Tawi Tawi and Tabulunga island to the westward, is $2\frac{1}{2}$ miles long and 4 cables in width. The northern part of the channel is direct and clear, with depths of from $4\frac{3}{4}$ to 9 fathoms, but the southern part is narrowed by shoals, and the depth decreases to $2\frac{3}{4}$ fathoms, so that only small vessels can use it. In the northern part of the channel there is sheltered anchorage, with good holding ground, for vessels of any size; the sides are steep-to, but sand shoals extend out $1\frac{1}{2}$ cables from the entrance points.

Tabulunga is separated from Tawi Tawi by a narrow and impracticable channel (Maipat), with shores covered by mangroves, and has a depth of 2 to 3 fathoms on its eastern side. This coast, and the banks which lie south-eastward of Bas Bas island towards Dalumon island, form the continuation of the Bas Bas channel, which is obstructed here by an islet, and a 3-foot bank having a rock on its northern end.

Dalumon island, lying $1\frac{1}{2}$ miles south-east of Bas Bas, has a small shoal on the north-west side, and another on its south point. A rock, awash at low water, lies north of Dalumon, about midway between it and Panjumajan; and a similar rock lies about 2 cables from the north-east coast.

Tankan islet, 3 cables south-east of Dalumon, is 3 cables in extent, and surrounded by depths of 5 to 7 fathoms. In the middle of the channel that separates it from Dalumon there is but $2\frac{1}{2}$ fathoms.

Baturrapa island is clean and steep-to on its south and west sides, but has shoal water off it in other directions; there is a depth of $5\frac{1}{2}$ fathoms in the channel between it and Tankan.

Dangers.—At 7 cables S. $\frac{3}{4}$ W. of the eastern extremity of Baturrapa there is a rock that uncovers, surrounded by a depth of $5\frac{1}{2}$ fathoms, and at 9 cables S.S.E. there is another rock covered by $1\frac{1}{2}$ fathoms. A patch of one fathom lies 2 cables N.E. of the east point of Baturrapa, and another of half a fathom lies $1\frac{1}{2}$ miles east of the same point; between these there is a patch of $2\frac{1}{2}$ fathoms.

See chart, No. 928 [2,614].

Tonkian islets are two little islets lying three-quarters of a mile south of Dalumon.

Tabu-tubu islet, W.S.W. of Tonkian islets, is separated from them by a passage 2 cables in width; a small shoal, and a patch of 2 fathoms lie near it, to the northward.

The coast of Tawi Tawi at this part is low, submerged and covered with mangroves, and bordered by shoals.

Tandubato island, separated from Tawi Tawi by an impracticable channel named Gallo Mallo, is nearly round, and about 5 miles in diameter. The peak of Tandubato rises to a height of 635 feet from among a chain of hills on the north-eastern coast. The shores of the island are skirted by a labyrinth of reefs and islets. Taruk is a low island about $1\frac{1}{2}$ miles in extent, almost joined to the north-eastern part of Tandubato; it is surrounded by shoals and islets; those to the eastward form the western side of the channel Noche Buena. One of the islets on the north-east side, Nahuan, 182 feet high, is a mark for the Noche Buena channel; a shoal extends north-eastward from it, parallel to the coast of Kalupag.

Great Kalupag forms the eastern side of Noche Buena, and the western side of Kalaitan channels. It is divided into two by the narrow channel Kalanhalangan, and has several hills upon it, the highest of which is elevated 590 feet above the sea; the southern part is named Tigungun, and is in fact a separate island 3 miles in length, and 425 feet in height. To the northward Kalupag is clean, with deep water near it, but the southern part of Tigungun is surrounded by reefs and islets near which the general depth is $2\frac{1}{2}$ to $5\frac{1}{2}$ fathoms.

The Kalaitan islets lie on an extensive reef between the south-east coast of Tigungun and Bukutkut bank.

Little Kalupag, lying 2 miles north-west of Pasegan Samal, has on its north-west and south-east extremities two conical peaks, 370 and 354 feet in height, respectively. The island is clean and its sides steep. The islet Bakiki, 239 feet high, lies $3\frac{1}{2}$ cables from the north point of Little Kalupag, and at 7 cables north-east of the north-east point there is a patch covered by $2\frac{3}{4}$ fathoms. The channel that separates Little Kalupag from the north point of Great Kalupag is 5 cables wide, and is divided into two narrow deep passages by the little clean island Charuk.*

CHANNELS to the EAST of TAWI TAWI.—There are four channels between the islands and reefs that lie east of Tawi Tawi and west of Bukutkut bank; of the four, two only are navigable by vessels of any draught, these being Kamba or Lijat, and Noche Buena; the other two are foul and of little depth.

* In the *Nassau's* survey Channel rock (not examined) is said to lie N.W. $\frac{1}{4}$ W. $8\frac{1}{2}$ cables from the north point of Little Kalupag.

See chart, No. 928 [2,614].

Kamba channel, between Bukutkut bank to the east and Kalaitan reefs to the west, is 2 miles in length in a north and south direction, and one-third of a mile wide in the narrowest part, with a depth of 7 to 9 fathoms. To enter it from the northward, a vessel should pass between Kalupag and Pasegan Guimba, or between the two Pasegans; the latter route, however, seems suitable for light draught ships only. This channel is considered preferable to that of South Ubian for vessels of good draught of water, but should not be attempted at night; the currents in it are very strong.

Kalaitan channel, between the edge of the Kalaitan islands bank and the south-east coast of Tigungun, is only practicable for handy vessels of less than 6 feet draught. The north entrance is divided into two arms by a shoal; the southern end joins the Kamba channel by the Sipungut channel, which runs east and west. The little channel north of Tandubas is impracticable.

Noche Buena channel, between Kalupag and Tandubato islands, allows a passage being made to the south of Tawi Tawi without leaving the archipelago, and without exposure to the sea of the open waters, which is sometimes very heavy during the S.W. monsoon; it is practicable for vessels of 19 feet draught, and there is anchorage everywhere in it. It is 6 miles in length, and $2\frac{1}{2}$ cables wide in the narrowest part.

Directions for Noche Buena channel.—Coming from the north: when westward of and near to Little Kalupag a vessel should steer S.W. $\frac{1}{4}$ S. for a hill 182 feet high on the south-east part of the islet Nahuan, and continue that course until a hill 590 feet high on the north-west part of Great Kalupag in line with a smaller one 476 feet high near the beach bears S.E. $\frac{1}{4}$ S.; she should then steer S. by W. $\frac{7}{8}$ W. and pass in mid-channel between a narrow bank covered by 13 feet on the northern end, and 3 feet on the southern, and a rocky shoal covered by 10 feet, until abreast of the little verdure-clad islands Tampa Tampa and Gondol, which must be passed close to. The vessel should then steer S.W. $\frac{1}{4}$ S. for the hill 635 feet high on the south-east coast of Tandubato island, and continue this course in mid-channel until arriving between the islet Sinagbuan to starboard and the islet Sibuluak to port, and then turn to the south, passing at one cable to the eastward of a remarkable and clean rock north-east of the island Tambilungana and close to it.

From this rock the course is S. 7° E. to pass midway between the shoals Ambilon and Kasapaan, in depths of $4\frac{1}{2}$ to 6 fathoms; then the passage is to the west between the islands Plus and Ultra into the great bay south of Tawi Tawi.

Caution.—It is not prudent to pass between the islands Plus and Ultra facing the sun when low; at other times the banks can be

See chart, No. 928 [2,614].

distinctly seen, and no mistake should be made by attention to the chart. The channel between the islands is narrow, and the least depth is 4 fathoms. The natives of Ultra often open fire on vessels passing through the channel. Another passage practicable for small vessels is north of Plus and of Pintada island, which is on the same bank.

Water.—On the south-east part of Tambiluanga there are three wells of good water, but the supply is not great.

Gallo Mallo channel, between Tandubato and the east coast of Tawi Tawi, can be penetrated by gunboats to a distance of 2 miles from the northern end. The sides of the channel are high and covered with lofty trees. Many creeks open into it, and the important town called Mapait by the natives is said to be in this locality.

ISLANDS SOUTH OF TAWI TAWI.—The islands Tandubas, Sekubun, and Lataan, occupying a space 9 miles in length north-east and south-west, are low, and lie so close together that they generally appear as one island; they are inhabited and cultivated in the interior, with wooded coasts. The outer edge of the reef on which these islands are situated is distinct, and very steep, there being no bottom with 114 fathoms at a cable's length from it.

The passage between Tandubas and Sekubun is only fit for light native craft; the channel between Sekubun and Lataan, called Paragua channel, may be used by vessels of any size; the edges of the reef can always be seen from aloft.

Mantabuan and Banaran are two flat islands united by a reef, on which near the middle is the small islet Sasa. Mantabuan is inhabited, but Banaran is not. In the channel between Mantabuan and Lataan the depth is $4\frac{3}{4}$ fathoms; the edge of Mantabuan reef shows clearly, and is steep-to, but the western end of Lataan reef is more shelving and not so easily seen. To enter this channel from seaward, steer in midway between Mantabuan and Lataan reefs on the course N.W. $\frac{3}{4}$ W., when a small sand bank (Circe), that generally uncovers, may be seen ahead.

The channel west of Banaran is wider and has a depth of $6\frac{1}{2}$ fathoms in the centre; it can be navigated by keeping midway between the edges of the reefs.

Basibuli reef, with the islet Basibuli on the centre, some smaller islets to the south-west, and Pananpangari islet on the north-east end, partly uncovers at low water; the reef is of sand and coral, and steep-to. The channel westward of the reef is deep.

Bilatan island and Bilok Bilok bank.—Bilatan is an island about $3\frac{1}{2}$ miles long, standing on the eastern side of the great Bilok Bilok bank that runs south from Tawi Tawi island. There is a large village at

the north-west point of Bilatan, and the island appears to be well populated, judging by the traffic between it and Tawi Tawi and the islands to the south-west.

From the southern end of Bilatan the coral reef, about 3 miles in width, with a chain of small islets and sand cays upon it, extends 9 miles to the south-west; one of the largest islets, Tumbukan, has a huge tree in the centre of it. Tiji Tiji bank, with a sand cay near its edge forms the south-west entrance of the reef.

Balambing channel separates Bilok Bilok bank from the coast of Tawi Tawi; vessels using the channel are recommended to keep on the coast side, but the channel off Balambing point has been reported to carry a depth of 2 fathoms only.

On the north-west point of Bilok Bilok bank, about one mile south of Balambing, are two small flat-topped rocks 12 feet in height, named Dulang-Dulang, from which the reef dries eastward upwards of 3 miles, dotted here and there with little black boulders. The reef also trends southward from the Dulang-Dulang rocks for about 5 miles, then curves south-westward to its south-west end.

Laa island, of coral formation, and covered with trees, the highest being 116 feet above the sea, lies about $1\frac{1}{2}$ miles from the north-west edge of Tiji Tiji bank.

Sanguisiapo is a small low coral islet, with a few straggling bushes on it, standing on a coral reef about $1\frac{1}{4}$ miles in length, that runs in a W.N.W. and opposite direction; this reef is steep-to eastward, but from its west end a bank of sand and coral extends W.N.W. $1\frac{1}{2}$ miles to its 5-fathoms limit. There is also a patch of rocks and a rock awash about one mile N.W. by N. from the highest bush on the island.

Danger.—Between Laa island and Sanguisiapo there is a dangerous coral reef about a quarter of a mile in extent, and westward of this again in the same direction, and about in mid-channel, a small 3-fathoms bank.

Simonor and **Manuk Manka** are the two largest off-lying islands to the southward of Tawi Tawi. Simonor has a fringe reef of coral round it, which is steep-to, with no anchorage round its coast. There is a shallow lagoon with its entrance on the north-east side of the island, in which native prahus take refuge on the approach of danger.

Manuk Manka has a fringe reef nearly all around it, and is also steep-to; there is a deep channel between these islands, as well as between Simonor and the islets and reefs north and east of it. There are several towns on Simonor, and both it and Manuk Manka are thickly inhabited.

If bound to Balambing or Bonguo from the southward and eastward, the north sandy point of Manuk Manka should be steered for until the

west end of Laa island comes in line with a remarkable cliffy hill on Tawi Tawi island called the Thumb (736 feet), bearing N. $\frac{1}{2}$ W., which leads nearly mid-channel between Simonor and the Tiji Tiji bank; when near Laa island haul to the north-east, passing it at the distance of 2 or 3 cables.

Bongao island.—This island, the most western of the Tawi Tawi group, is nearly $2\frac{3}{4}$ miles long by $1\frac{1}{2}$ miles in breadth; its highest peak is elevated 1,151 feet above the sea, and there are several others of considerable altitude. All these peaks are cliffy to the northward, and present a curious appearance on some views from that direction, the summit of the island having apparently been broken up by volcanic agency. With the exception of these cliffs, the whole island is densely wooded, the jungle being impenetrable for more than a few yards, and uninhabited.

Sanga Sanga island is about $6\frac{1}{2}$ miles in length in a north-east and south-west direction, and $3\frac{1}{2}$ miles across at the widest part; it lies immediately northward of Bongao, between it and Tawi Tawi island, and is separated from the former by a very narrow passage called by the natives Trusan Bongao, through which there is only a channel for small craft of light draught. Unlike Bongao, this island is not high, has no conspicuous hill on it, and is covered with trees. There are a few small patches of cultivation on the south-east side over Pandan bay, where there is a Panglerna or chief, but there is none in any other part of the island.

The channel between it and Tawi Tawi is shallow, and only available for boats or prahus of light draught; its entrance from the northward is almost hidden by Trusan Bongao island (Takut Mataha) and reefs.

Papahag island lies south of Sanga Sanga, and east of Bongao, and is separated from each by narrow channels, the former having a least depth of 8 fathoms, and the latter of $3\frac{3}{4}$ fathoms. The south-west side of this island is well planted with cocoanut trees, but it does not appear to be thickly inhabited.

Shoal ground extends south-eastward half a mile from the south-east side of Papahag island, at the outer extremity of which the depth is three-quarters of a fathom; a patch of $2\frac{3}{4}$ fathoms lies one cable south of Matos point, the south end of the island; and a coral patch of 3 fathoms is situated 4 cables west of Matos point, between which and the south-west shore fringed with a coral reef, there are three large coral shoals with depths of $1\frac{1}{2}$ to $2\frac{3}{4}$ fathoms.

Port Bongao is formed by the islands Bongao, Sanga Sanga, and Papahag. The village of Bongao contains a fort, a store, quarters for the garrison, and a few merchant houses. Thumb hill open of Matos point, bearing N.E., clears the shoal extending from Martinez point.

Tides.—At Bongao it is high water, full and change at 6h. 40m.; springs rise 6 feet. The flood stream sets north-west and the ebb to the south-east, at the rate of 2 to 4 knots an hour; but it takes many

See plans, No. 1,243 [2,615], and of Port Bongao on chart, No. 2,376 [2,605].

directions round the reefs, and between Simonor and Sanguisiapo it runs like a race with whirls and heavy overfalls, even in a calm.

Chongos anchorage (Pandan bay).—On the south side of Sanga Sanga is a snug anchorage, well sheltered from all winds, with good holding ground; vessels going close in should be careful to avoid the rock awash and the 6-foot coral patch in the middle of the entrance. The best anchorage is, however, outside the bay, in a depth of from 11 to 13 fathoms, mud, with the Panglema's house (on the east side of the bay) bearing N.N.W. $\frac{1}{2}$ W., and south point of Sanga Sanga W.S.W.

Supplies.—There are no supplies to be obtained, the few people residing here living on the few fish they catch.

Tangao is a small islet covered with trees, distant about $1\frac{3}{4}$ miles E. by N. from Papahag island and 4 cables from Tawi Tawi; there is a reef projecting half a cable to the southward of it, the extreme of which dries at half ebb.

A rocky point on the southern shore of Tawi Tawi island, off which a reef extends $2\frac{1}{2}$ cables, lies $1\frac{3}{4}$ miles eastward of Tangao; and a detached reef that dries 2 feet lies about three-quarters of a mile eastward of the above rocky point; from this to Lubukan there are no off-lying dangers.

Lubukan island, $5\frac{1}{4}$ miles eastward of Tangao, is moderately elevated, and is connected to Tawi Tawi by a reef dry at low water. Between this and Balambing point is a deep bight with the island of Samanput, 276 feet in height, in the middle, to the westward of which there is anchorage in a depth of 9 fathoms, mud.

Balambing, a town on the south coast of Tawi Tawi, was destroyed by a Spanish squadron in 1871, since when, on a steamer being seen, the inhabitants take to their boats and seek refuge in the well sheltered creeks that abound to the north-east.

They are pirates when opportunity offers, taking and enslaving the crew of any trading prahu weaker than themselves. This was formerly the great boat-building establishment for nearly the whole of Tawi Tawi, but since the visits of the Spanish gunboats this industry is carried on at a place called Lupa Buan, about 10 miles to the north-east.

Anchorage.—There is good anchorage anywhere along the south coast from Bongao to Balambing in about 13 fathoms, sand and coral, muddy bottom being sometimes obtained to the west and south-west of Lubukan island, where the holding ground is good. There is also good anchorage on the Sanguisiapo bank in a depth of from 6 to 10 fathoms, sand.

Supplies.—When anchored north of Laa island in H.M.S. *Nassau*, the natives of Simonor came off with fowls, goats, coconuts, sweet potatoes,

See plan, No. 1,243 [2,615].

and fish, which they bartered for tobacco, knives, razors, buttons, &c., at a moderate rate. They only appreciated money as enabling them to make ornaments for their weapons.

Tawi Tawi bay.—The interior of this great bay is filled by banks and shoals, with navigable channels between them, too numerous and intricate to describe. By piloting from the masthead, and with the aid of the chart, the navigation is easy; but the sun should be at a good altitude and behind the pilot. It is also essential that the vessel shall be handy, as many of the turns in the channels are very sharp.

Lupa island, eastward of Balambing, is separated from Tawi Tawi by an impracticable channel.

Buan island is in the great bay north of Balambing, and near the coast of Tawi Tawi. It is 397 feet in height, well cultivated, and has good water; there is a remarkable tree on the centre of the island. Large vessels can anchor about 2 miles south of Buan in a depth of 10 fathoms, while vessels of lighter draught can anchor north of it in 4 to 5 fathoms.

Simanale anchorage is in the northern part of the passage that separates Sanga Sanga from Tawi Tawi. Trusan Bongao island shelters and almost conceals the entrance of this channel, which is but half a cable in width between the shoals on either side, with a least depth of $3\frac{1}{2}$ fathoms. Within the entrance the port widens to 8 cables, but shoals on either side as well as in the middle greatly reduce the available space, and vessels should moor. In the northern part of the anchorage the depth is 6 to 9 fathoms, but it shoals to $4\frac{1}{2}$ and 2 fathoms in the southern part.

Winds.—On the coast of Tawi Tawi and at the anchorage south of Bongao, the following winds have been experienced:—During the months of February and March, the winds were from N.N.E. to N.E., with occasional calms, and light airs from the northward; the squalls from N.E. blew very heavily at the anchorage south of Bongao.

During April and the early part of May it still blew fresh from the N.E., but after the 6th May calms and light airs were experienced until the end of the month, when it began to blow steadily from E.S.E. to S.E., force one to 3; these south-east winds prevailed in the Sulu sea until July.

Weather.—Heavy showers were experienced in January and February with misty weather; March and April were finer, but the weather was still misty; May was almost free from rain, with the exception of an occasional passing shower, the atmosphere being generally clear; in June it was clear between the passing showers, which were, however, very heavy and frequent.

* See chart, No. 928 [2,614], and plan, No. 1,243 [2,615].

TATAAN or SIMALAK ISLANDS consist of a chain of nine small islands or coral reefs, extending for 8 miles north-east and south-west, nearly parallel to the north-west coast of Tawi Tawi, leaving between it and them a clear commodious channel about $1\frac{1}{2}$ miles wide, which forms the port of Tataan.

The two small, narrow, Simalak islands are the most easterly of the group; they lie close together, and are covered by high trees visible at the distance of 12 miles. Kabankauan island lies one mile to the south-west, and consists entirely of mangroves on a flooded reef. These three islands rest on a coral reef which almost dries at low-water, and which extends $1\frac{1}{2}$ miles north-east of Little Simalak. On the northern part of the reef there is a shoal of sand and gravel, visible 4 miles off, which serves to indicate the reef; another shoal on the north-west part is generally covered.

Nusa Lakit, and Nusa Takbu are two wooded islands lying one mile west-south-west of Kabankauan. The reef they stand on is separated from those on each side by navigable channels, known as the Nusa Takbu and Basun channels; it extends one mile northward of the island, and has on its north-east end a sand shoal which marks the western edge of the Nusa Takbu channel. South-eastward of the islands the reef extends 2 cables, and has off it a chain of coral patches extending 2 cables farther out, and from one channel to the other, making the approach dangerous.

Basun and Tinakta islands.—The Basuns are two wooded islands which lie half a mile west of the Nusa islands. Tinakta, which is covered by tall trees, lies a good mile south-west of the Basuns, and on the south-west extreme of the reef on which these three islands stand. The reef which is of sand and coral, with mangrove islets on it, reaches more than half a mile to the north and north-west, and is steep-to; on the northern part there is a cay of broken coral of a glistening white, and visible at the distance of 4 miles; this cay marks the western edge of the entrance to the Basun channel. South-eastward of the Basuns the reef runs out in two points to a distance of 4 cables.

Sipayu, the westernmost of the Tataan chain, lies $2\frac{1}{2}$ miles S.W. by S. of Tinakta, and half a mile from the coast of Tawi Tawi, from which it is separated by a clear channel in which the depth is 6 fathoms. The island is of clean sand, and stands on the southern edge of a coral reef which extends half a mile to the northward and westward, and has on its northern part a bank of sand and coral which serves to mark it.

The channel between Sipayu and Tinakta is of uneven depth and has several shoals in it; bottom, sand and coral.

Coast.—Bakun point, at the eastern entrance of Tataan channel, is a low prominent point covered with tall trees, and surrounded by a reef about half a cable in extent. Two miles to the eastward is the little bay of Moko, and midway between it and Bakun point a noticeable beach—the rest of the shore consisting of mangroves.

Port Tataan.—From Bakun point the coast trends west-south-west for $1\frac{1}{2}$ miles to the next point, including a slight indentation at the mouth of the river Bakun; from this point, which is opposite Kabankauan island, and is clean and steep-to, the coast trends first S.S.W. for about 2 miles towards the bottom of a bay with two small shoals in it, which uncover at low-water, and then W.S.W. to the settlement of Tataan. The settlement is on a small hill, and consists of a fort and a few houses.

Anchorage.—The best anchorage is in a depth of 9 to 11 fathoms with the mole in line with the fort; further to the westward the depth is 14 fathoms, and here large vessels can anchor. The anchorage is exposed to the gales from S.W. and N.W. which blow in the months of June and December, when a sea sets in; vessels can then anchor to the eastward of Kabankauan, where there is shelter from all winds.

Tides.—It is high-water, full and change, at Tataan at 7h. 23m. springs rise $3\frac{1}{4}$ feet at the equinoxes, and $6\frac{1}{2}$ feet at the solstices; the tidal streams are weak inside the islands.

Supplies.—None can be obtained here, except fish and water: the water is good, but not abundant.

From the settlement the coast, which is thickly wooded, trends about S.W. by W. for about 5 miles to a bay almost closed by a coral reef; it then curves westward, to Bugut Lapit point, and is low, wooded, and fringed by a reef that extends out about one cable.

Directions.—The north-eastern channel, between Bakun point and the Simalak islands, is the best; it is two-thirds of a mile in width and has a depth of 11 fathoms in the middle, decreasing on either side. Within, the channel widens to $1\frac{1}{2}$ miles, and the depth increases in the middle to 16 fathoms. A vessel making for the Tataan anchorage should bring the fort to bear S. by W., and steer for it on that bearing in order to pass clear of the westernmost of the two shoals before mentioned.

The Nusa Takbu channel, between Kabankauan and Nusa Takbu, is 3 cables in width, with a depth of 4 to 7 fathoms; and runs north and south in a direct line with the settlement of Tataan. Vessels using this channel can keep a mid-channel course while northward of Nusa Takbu; but after passing that island the reef of Kabankaban, which is steep-to, should be closed in order to avoid the shoals extending south-east of the Nusa Takbu reef.

Basun channel separates the Basun and Nusa Takbu reefs; its northern entrance is marked by the cay of broken coral already mentioned; the southern part of the channel is dangerous on account of two shoals of 6 and 13 feet off the extremity of Nusa Lakit reef; in taking this channel it is therefore better to keep on the western side. Information is wanting as to the depth of water in this channel.

Western channel, between Sipayu and the coast.—In this channel there are two small banks, one of $3\frac{1}{2}$ fathoms situated one cable northward of the extremity of the coast reef, the other, of $4\frac{1}{2}$ fathoms, lying 2 cables from the coast in front of the little bay to the eastward of Bugut Lapit point. Between these shoals and Sipayu islands there is a clear channel with depths of 6 to 10 fathoms. The southern shore of Sipayu is clean; it is better, therefore, to keep on that side of the channel.

Port Dos Amigos is situated 7 miles north-eastward of Bakun point. The entrance between points Tokanhi and Lamnuyan, both of which are clean, is half a mile wide; thence the port runs in to the southward for about 6 cables, and then turns to the north-east for about a mile with a width of $1\frac{1}{2}$ cables, the depth diminishing from 10 fathoms at the entrance to 8 fathoms at the turning, and to 5 and 3 fathoms at the bottom of the port. The best anchorage is off the turning in 8 fathoms, sand and mud. There is a good watering-place in the port.

Shoal.—There is a shoal of $4\frac{3}{4}$ fathoms in the approach to port Dos Amigos, situated about a mile north-west of Tokanhi point.

PANGUTARANG GROUP.—Pangutarang island, 10 miles in length and the largest of the group, situated about 24 miles north-west of the west end of Sulu island, is low and level, little more than the trees showing above water. It is thickly inhabited, and carries on a brisk trade with Sulu. The principal place, Maglakob, lies on the east side, some distance inland. The coast near it is enveloped by coral and sand banks, between which there is an entrance at high water into the lagoon formed by the coast and the reefs. The island contains numerous cocoanut trees, the milk from which is used by the natives instead of water, which in the hot season is very brackish, and during the rainy season nearly black. Strong currents are reported to exist between this group and Taganak island.

Pandukan is an island east of Pangutarang, $6\frac{1}{2}$ miles in length north and south; like the rest, it is covered with trees, a conspicuous peaked clump at its south end being the highest. The passage between Pandukan and Pangutarang is about $2\frac{1}{2}$ miles in width.

Kulassun, about 4 miles north of Pandukan, is joined to it by a chain of black rocks on a bed of white sand. Over these rocks are depths of one to $1\frac{1}{2}$ fathoms, and between them of 3 to 4 fathoms. Northward of

Kulassun, and at the distance of about 8 miles from it, two small islands surrounded by a reef are charted; the existence of these islands is doubtful. The U.S.S. *Annapolis*, passing 4 miles northward of the given locality, October 1901, did not see the islands, though the weather was favourable, and position of ship well fixed.

Caution.—Large vessels should not try to pass between the islands north-east of Pangutarang; the vicinity has been very imperfectly examined, and the tidal streams run at the rate of 6 knots at springs.

Tubigan, lying 3 miles E.N.E. from Kulassun, is a small wooded island with a stream in which there is good drinking water.

Teomabal island, $2\frac{1}{2}$ miles in length east and west, lying 9 miles eastward of the north end of Pandukan, is low and wooded; a bank extends 6 miles E.N.E. from the island, upon which the depth is 6 to 10 fathoms.

Teomabal bank, of 5 fathoms, is situated 7 miles E.N.E. of the island of that name, and is separated from the bank extending in that direction from the island itself by a deep channel one mile in width. Two miles further east-north-eastward there is another bank with depths of 7 to 9 fathoms.

About $2\frac{1}{2}$ miles north of Teomabal detached bank, at the distance of 9 miles N.E. $\frac{1}{2}$ N. from the east point of Teomabal island, there is a patch of $1\frac{1}{2}$ fathoms on the south-west end of a shoal with depths under 5 fathoms and about 2 miles in extent.

Pantokunan has been described with the Sulu group; see p. 115.

Pangutarang passage is the channel between Pangutarang island to the north, and North Ubian and Usada islands on the south; it is 5 miles in width and very deep. North Ubian and Usada are the largest of the group of thickly wooded islands lying to the southward of Pangutarang.

North Ubian, almost circular in shape, about 3 miles in diameter, and 74 feet in height, is inhabited, the largest town Suang-bunah being on the south-west side, in a deep bight, well protected by a coral reef. There is another village in the interior named Aloh.

From North Ubian a bank, with from 6 to 12 fathoms over it, extends in a S.W. by W. direction 19 miles to Cap island. This bank affords a good stopping place for a ship taking the Pangutarang passage; its northern edge is very steep.

Malikut, a small island south-west of North Ubian, distant about 3 miles, is a little more than half a mile long by a quarter of a mile wide.

A reef extends a quarter of a mile to the north-west, dry at low-water, and is continued by a bank in the same direction, the 5-fathoms limit of which is about N.W. $\frac{1}{2}$ W. $1\frac{3}{4}$ miles from the extreme of the island.

Tikul lies about one mile eastward of North Ubian, with a deep channel between; it is 87 feet in height, about three-quarters of a mile long, and off its north end are two sand cays, with trees on them. There are paths through this island, all converging to a well near the centre; the water however is brackish.

Usada, 3 miles E. by S. of Tikul, is fringed by a reef; there is a lagoon on the western side of the island, with an opening into the sea through the reef, over which native boats run at high water. Usada appears to be well inhabited.

Kunilan, the tops of the trees on which are 67 feet above the sea, lies about $1\frac{1}{2}$ miles south-west of Usada, with a passage between the two islands; the island is about one mile in length in a north-west and south-east direction.

Bas-Bas, lying about $2\frac{1}{2}$ miles S.S.W. of Kunilan, is 63 feet in height, and covered with trees.

All the low islands of this group appear to have been coral reefs or sand cays originally, as the surface of the soil is not much above the high-water level of extraordinary spring tides.

Anchorage.—There is anchorage between Malikut and North Ubian in depths of from 5 to 10 fathoms, but the bottom is hard and smooth. The *Nassau* anchored 5 cables south of the rocky islets at the entrance of the creek on the south-east side of Usada, in 11 fathoms, sand and coral, in fair holding ground.

There is also anchorage about one mile westward of Malikut, in a depth of 7 to 9 fathoms, but the tides run strong at springs.

Laparan island, situated 23 miles S.W. by W. $\frac{1}{2}$ W. of Malikut, is 5 miles in length in a N.N.E. and S.S.W. direction, 3 miles in breadth, and covered with trees. To the westward it is fronted by a coral reef with several small islets on it, the reef being steep-to. There is no anchorage off the west side of Laparan.

A $4\frac{1}{4}$ -fathoms coral bank, $1\frac{1}{2}$ miles in breadth, extends 4 miles E.S.E. from the middle part of the east side of Laparan, on the outer end of which is the island of Deoto Bata. This locality is absolutely unsurveyed.

Dok-Kan is separated from the south-west end of Laparan by a channel about a quarter of a mile wide. In the centre of this island is a large lagoon with several islets in it. A bank with a depth of from 5 to 8 fathoms extends about 2 miles north-westward from Dok-Kan.

Anchorage.—There is anchorage south and north-west of Dok-Kan, but none north of its eastern part; outside the 20-fathoms limit the bank is steep-to. On the southern side of the island a ship should anchor directly the depth of 9 or 10 fathoms is obtained, as deeper water will be found between those soundings and the edge of the reef.

Tides.—It is high water, full and change, at 6h.; springs rise 5 feet. The observations were made at the time of the equinox, when there was only one tide in the 24 hours, and the flood stream ran for 9 hours and the ebb for 3 hours; the flood setting N.N.W., ebb S.W. at the rate of 3 to 5½ miles an hour.

Billanguan island, 16½ miles south-east of Dok-Kan, is about three-quarters of a mile in length north-west and south-east, and like the majority of the islands in this archipelago, is low and covered with trees. It is surrounded by coral reef to the distance of nearly half a mile, and a detached patch lies one mile W. by N. ½ N. from its north extreme.

A bank with about 10 to 12 fathoms over it extends nearly 3 miles to the southward of this island, where a vessel may anchor if necessary, but the holding ground is not good.

Bambannan, another low coral island covered with trees, lies about 4 miles south-east of Billanguan; it is only visited by the natives of Tawi Tawi occasionally for fishing purposes; off the south side there is anchorage in about 13 fathoms, during the N.E. monsoon.

Uwaan, Mamanuk, and Lahat Lahat, lying to the north-east of Billanguan and Bambannan, are similar to those islands in formation and character.

Caution.—The other islands included between North Ubian, Laparan, and Bambannan have not yet been surveyed, and vessels should not pass between them.

The Pearl bank.—This extensive bank, situated about 10 miles westward of Dok-Kan, on which are Taja and Zau islands, is a formation of coral and sand, lying about E. by N. and W. by S., 15 miles in length, with an average width of 7 miles, and is very steep-to. Nearly in the centre of this is a circular coral reef about 18 miles in circumference, which dries in patches at low-water spring tides. The opening leading into the lagoon formed by this coral reef is on its south-west side, and has a bar extending across it with depths of from 9 to 13 feet.

The reef has several small islands and islets on its west, south, and east sides, the highest (50 feet) being near the south-east extreme; all these are low, covered with bushes, and hardly visible at a distance of 6 miles.

If running down at night to pass either to the east or west of the bank the soundings would give warning of the vicinity of the central reef, but it is too steep to the north and south for the lead to be of more than little service unless going very slowly.

Anchorage.—There is fair anchorage on the bank either to the north-east or south-west, in the S.W. and N.E. monsoons respectively, but the tides are very strong, running at the rate of from 3 to 5 knots an hour.

See charts, Nos. 928 [2,614] and 1,868 [2,613].

Tides.—It is high water, full and change, on the Pearl bank, at 6h. 5m. ; springs rise 5 feet.

Talamtan bank is composed of sand and coral, the shoalest part of 5 fathoms being in lat. $5^{\circ} 42' N.$, long. $119^{\circ} 26\frac{1}{4}' E.$ It is about 3 miles in length north-west and south-east, and $1\frac{1}{2}$ miles wide, within the 10-fathoms contour-line.

With wind against the tide there are heavy overfalls and tide rippings round this bank, sometimes extending as far as the eye can see, and much resembling broken water.

See charts, Nos. 928 [2,614] and 1,868 [2,613].

CHAPTER IV.

NORTH-EAST COAST OF BORNEO.—FROM BANGUEY ISLAND
TO SIBUKO RIVER.

 Variation $1^{\circ} 45'$ East in 1902.

The territory of the British North Borneo Company includes the whole northern portion of Borneo island, together with all the islands within a distance of 9 miles from Sipitong river in lat. $5^{\circ} 6' N.$ on the west coast, to Sibuko river on the east coast in lat. $4^{\circ} 5' N.$, and comprises an area of 31,000 square miles, with a coast line of about 900 miles.

The population, about 175,000, consists mainly of Mohammedan settlers on the coast and aboriginal tribes inland, with some Chinese traders and artisans.

This chapter describes that portion of the north-east coast of Borneo with the off-lying islands, from Banguey on the north to Sibuko river in the south, along a coast line of 400 miles. There are several good harbours, the principal one of which is Sandakan, the seat of Government and chief place of trade. The Company has also settlements at Mitford in Banguey island, Silam and Lahat Datu in Darvel bay, and Simporna in Trusan Treacher. Kudat, in Marudu bay, is described in China Sea Directory, Vol. II.

Climate, Meteorology, &c., from the report of Dr. James Walker, M.D., principal Medical Officer.

The climate of British North Borneo is noticeable for nothing more than for its equability, and the absence of extremes. The temperature, rainfall, winds, natural phenomena generally, and the diseases, are, for a tropical country, of the most mild and temperate types.

Monsoons and Winds.—The north-east monsoon commences about the middle of October, and continues till about the middle of April; during the greater part of this time the wind blows steadily and with moderate strength, from the north and east, gradually dying out. In the course of this monsoon, more particularly in December and January, there are generally one, two, or three moderate steady gales, lasting from 3 to 9 days; at other times the wind is a moderate breeze, which, beginning about 11 a.m., gets rather stronger towards evening, and dies away

See charts, Nos. 287 [2,598] and 2,576 [2,605].

in the early morning, when it may be overcome by a gentle land breeze. At the commencement and end of the monsoon the wind is not so strong or so steady, and the land breeze continues till later in the forenoon.

The south-west monsoon lasts from about the middle of April till the middle of October. The wind as a rule is not so strong in this monsoon; the land breeze in the morning is more marked, and the gales are not so heavy nor so long continued as in the north-east monsoon. On the other hand, there are frequently squalls in the afternoon and evening, lasting for an hour or two, and sometimes blowing with the strength of a fresh gale. Neither in this monsoon nor in the north-east monsoon does the wind rise to the strength of a storm, or even of a whole gale.

The prevailing winds in the afternoon during the south-west monsoon on this part of the coast of Borneo, north of Tanjong Unsang, are generally east to south; southward of Unsang they are usually more westerly, but always light. At night there is generally a land breeze.

Rainfall.—The annual rainfall near the coast, according to records kept during the seven years ending 1885, ranged from 101 to 157 inches, with an average of 124 inches.

The true wet season occurs in the north-east monsoon, and includes the months of November, December, and January, and generally part of either October or February or both. During this season the greater part of the rain falls from a uniform dull grey sky, and is pretty equally distributed between day and night; but the rain is not continuous.

The true dry season immediately follows this true wet season, and includes March and April, and generally part of February and the whole of May. During this time any rain that falls generally occurs in showers at night or early morning, and no month passes without several showers.

This true dry season is followed by a period of moderate rainfall commencing usually about June; the first month or six weeks of which may almost be called a second wet season, and the rest of the period up to the commencement of the true wet season, a second dry season. As, however, the limits of these two are ill-defined, their characters similar, and the difference in rainfall comparatively small, it is better to consider them together as a sort of intermediate season. During this period the rain falls chiefly in heavy squalls (either with thunder or from thundery clouds), occurring most frequently in the afternoon and evening, but not confined to that time; it is during these squalls that the heaviest falls of rain occur. On June 15th, 1884, 2·05 inches fell in forty minutes.

Temperature.—The temperature recorded at the coast has ranged between the extremes of 67·5° and 94·5°; but the difference in temperature between the various seasons of the year is very slight. The lowest average temperature (79°) for both day and night is during the

See charts, Nos. 287 [2,598] and 2,576 [2,605].

wet season in December and January; the highest average temperature during the night occurs during the dry season in April and May (74°); whilst the highest average temperature during the day is in August and September (89°).

The absence of tornadoes, cyclones, and earthquakes is to be noted. The peculiar phenomena of tropical climates generally are found here; thunderstorms with much sheet lighting are frequent during July, August, and September, and are sometimes severe. Mirage is generally present in the afternoon to a slight extent; phosphorescence occurs in great perfection in Sandakan bay.

On the whole the country appears to be fairly healthy for the tropics, less so than Singapore, but much better than the Dutch islands south of the equator. There is certainly a considerable amount of intermittent fever, and many visitors to the island are attacked; but the disease is not often fatal to Europeans.

Tides.—The tidal wave that enters the Sulu sea from the China sea by Balábac strait and Banguay channel, penetrates as far as Unsang peninsula, where it meets the wave from the Celebes sea, which enters by the Sibutu channel. The time of high water of the wave from the China sea is from 11h. 30m. to 12h. 0m.; and of that from Celebes from 6h. to 7h. The range of the tides is $6\frac{1}{2}$ feet at Sandakan; $5\frac{1}{2}$ feet off Dewhurst bay, and in Dent haven $3\frac{1}{2}$ feet.

BANGUEY ISLAND, the north-west extreme of which lies $2\frac{1}{2}$ miles east of Balambangan, is $19\frac{1}{2}$ miles in length in a north-east and south-west direction, and about 13 miles in breadth. The island is surrounded by a fringed reef, the south-east coast being faced by small islands, having deep water channels between, and large concealed channels behind, which formerly served as the principal rendezvous and hiding places for pirates. These small islands form part of the northern limit, and are included in the description of Banguay South channel. The west coast is included in the description of Banguay West channel, and the north coast in that of Balábac strait. Off-lying for several miles the north-east and east coasts of Banguay are numerous islands, islets, and dangers, as will be seen on the charts.

Aspect.—There are several ranges, also some detached hills, on Banguay; the highest, Banguay peak, 1,876 feet high, is at the north-west end of the island, and shows up as a very conspicuous object for more than 30 miles around. Viewed on a north-westerly, or opposite line of bearing, the apex appears as a nipple, but as this line of bearing is departed from, the nipple shape becomes less apparent, and the summit assumes a rounded form. A range of hills extends to the eastward for a distance of 6 miles, with East hill at the extreme, elevated 1,076 feet;

See chart, No. 948 [2,601].

thence some smaller ranges lie in a northerly direction, and terminate near the coast in North hill, 742 feet high. About $1\frac{1}{4}$ miles south-eastward of Banguey peak is a conspicuous hill 1,480 feet in height.

Balambangan island is described in China Sea Directory, Vol. II., and only the dangers on the northern side of the island, which affect Balábac main channel, are included in this work; *see* p. 150.

BALABAC STRAIT.—General remarks.—Balábac strait, leading from the China sea into the Mindoro or Sulu sea lies between Balambangan and Banguey islands on the south, and Balábac island on the north. The greater part of this strait is occupied by coral dangers far too numerous to admit of detailed description. These dangers are divided into groups, each group being distinguished by a special denomination—such as Mangsi danger bank, Great danger bank, &c. This arrangement distinctly defines the limits of the various channels, of which there are eight, between the dangers.

The high peak of Balábac island is the most conspicuous object in the vicinity of the strait, and is visible from all parts of it. Banguey and Balábac peaks lie N. $\frac{1}{2}$ W. and S. $\frac{1}{2}$ E. from each other, $37\frac{1}{2}$ miles apart, and as most of the dangers and channels are to the eastward of that line, these peaks are of the first importance for determining the position of vessels when navigating this strait.

For the convenience of navigators entering the Sulu sea from the westward, the main channel of Balábac strait is included here.

Balábac island, as also the other channels of Balábac strait, are beyond the limits of the scope of this work; navigators are referred for their description, and for that of the dangers in their vicinity, to the China Sea Directory, Vol. II.

Tidal streams.—The flood stream sets to the eastward and the ebb to the westward. The strength of the stream or of the current depends greatly on the prevailing winds. The greatest velocity observed was $2\frac{1}{4}$ knots.

In the months of October and November, after a succession of westerly winds, the current was found to set constantly to the eastward, slackening only on the ebb tide; while in July, after a continuance of unusually fine weather with light east and south-east winds, it set with the same strength, viz., from three-quarters to $2\frac{1}{4}$ knots in the opposite direction. The mean velocity observed for 13 consecutive hours was $1\frac{3}{4}$ knots.

The MAIN CHANNEL through Balábac strait is limited to the southward by the danger line, encompassing the reefs and shoals lying off the north and north-east coasts of Banguey (*see* page 151); and to the northward by Mangsi Great reef, the southern part of which is $1\frac{1}{4}$ miles

distant from the edge of the bank on the Banguey side. The depths in the channel are not regular, varying from 14 to 23 fathoms, the deepest water being rather nearer the reef than the middle of the channel.

This channel is now generally used by vessels proceeding to Sandakan, &c., the route by the Mallawallé channels being practically abandoned on account of the numerous charted and uncharted dangers existing in it. (H.M.S. *Rainbow*, 1897.)

Dangers on northern shore of Main channel.—Mangsi Great reef, the southern edge of which is situated $4\frac{1}{2}$ miles northward of North Gubuan, is 5 miles in length in an east and west direction by $2\frac{3}{4}$ miles in breadth, and is steep to on its southern side. It is nearly everywhere covered at high water, but a sand cay upon the eastern part is generally visible from aloft when near the edge. At low water the reef presents a vast expanse of coral and sand, with lagoons here and there.

From the west end of the reef, shallow water, under 10 fathoms, extends about 2 miles in a W.S.W. direction, with irregular depths; the least known is 4 fathoms, but the locality should be avoided. Banguey peak bearing southward of S.S.W., leads westward of it.

MANGSI DANGER BANK, situated about $1\frac{3}{4}$ miles north-eastward of Mangsi Great reef, includes within its limits the Mangsi and Salingsingan islands, with the extensive dangers adjacent; also Loxdale, Jessie, and many smaller shoals. This bank is 10 miles in length in an E. by S. and W. by N. direction, and 4 miles in breadth at the eastern end, tapering to the opposite extreme.

South Mangsi island, covered with trees, is round shaped, about half a mile in diameter, and stands upon a reef which extends from it one mile eastward, 6 cables westward, and for a less distance in other directions.

North Mangsi island, situated half a mile north-westward of South Mangsi, is covered with trees, which rise to an apex near the centre, 130 feet above high water. The island is three-quarters of a mile in length, and from its east end reefs and shoals extend—beyond those projecting from South Mangsi—for a distance of $2\frac{1}{4}$ miles, and some patches of 4 to 7 fathoms half a mile farther in an easterly direction: from the west end a line of reefs extends in a W. by N. $\frac{3}{4}$ N. direction, $3\frac{1}{4}$ miles.

Jessie shoal, with 6 feet least water, lying 3 miles E. by N. from North Mangsi island, is $1\frac{1}{2}$ miles in length and half a mile in breadth. This danger is situated at the east part of the bank, and shallow patches outlie its extremes.

Salingsingan island, 2 miles northward of North Mangsi, is composed of coral and sand, and covered with trees; it is rather more than half a mile in length, and one cable in breadth. Shoals, nearly awash in

See chart, No. 9487[2,601].

parts, stretch off three-quarters of a mile eastward, and, $1\frac{3}{4}$ miles westward, from the island, the breadth of the latter being nearly a mile.

Loxdale shoal, at the west end of the bank, lies $1\frac{1}{4}$ miles westward of the dangers extending from North Mangsi and Salingsingan, with deep water between. It is a coral shoal, nearly $1\frac{3}{4}$ miles in length, and from 3 to 5 cables in breadth, with $2\frac{1}{4}$ to 3 fathoms water, and fairly steep-to. From the west end of this danger Banguey peak bears S. by W. $\frac{7}{8}$ W., and Salingsingan E. $\frac{1}{4}$ S.

Kestrel rock.—H.M.S. *Kestrel* passed over a patch with 5 fathoms water, in the east entrance of Main channel, with Banguey peak bearing S.W. by W. $\frac{1}{4}$ W., and the west extreme of South Mangsi island N.W. by W. $\frac{3}{4}$ W.

Soundings of 8 fathoms were obtained by H.M.S. *Comus*, 1882, on a shoal about one mile south of Kestrel rock; caution should be exercised when in this neighbourhood.

DIRECTIONS for Main channel.—Vessels coming from the south-westward, and bound through Balábac strait, during the north-east monsoon, will find Main channel the most convenient. When approaching the north end of Balambangan island, do not bring Buttun point to the westward of S.W. $\frac{1}{2}$ S., nor come into less than 14 fathoms, until the north hill on Banguey bears E. by S. $\frac{1}{4}$ S., which latter mark leads one mile outside the dangers off Siagut point, and of those extending north of Tiga islet. The light green colour of the water over Great Mangsi reef will, even at high tide, enable a good look-out aloft to make out the edge sufficiently far off to permit of a vessel being guided past it at a safe distance. From about three-quarters of a mile off its south end, steer to pass about 2 miles southward of South Mangsi island, and the same distance northward of Kestrel rock, when the course may be altered to East, or as necessary according to destination. North hill will be found useful for bearings. This is the route generally adopted by vessels proceeding to Sandakan; the Mallawallé channels being much encumbered with shoals.

If proceeding to Sandakan, after passing the space with irregular soundings extending eastward from Banguey island to the distance of about 30 miles (*see* page 151), steer towards Muligi islands so as to make them on a S.E. bearing.

Coming from the Sulu sea, the Mangsi islands should be made bearing about West, thence steer to pass 2 miles southward of them; when the islands are abeam a course about W.S.W. will lead to the entrance of Main channel.

MANGSI CHANNEL, separating Mangsi Great reef from Mangsi Danger bank, is one mile wide at its narrowest part, where the

depths are irregular; it is deep throughout, having from 18 to 33 fathoms in the fairway. The reefs on the north side of this channel are steep-to; Mangsi Great reef forming the south side is less so, and from the northern side of the east point of the reef, shoal water extends in the direction of South Mangsi island to the distance of half a mile.

Directions.—Navigators will rarely have occasion to use this channel, but in case of necessity the following directions may be of assistance; with a proper look-out, no difficulty will be found in passing safely through. Coming from the westward, and having sighted the Mangsi islands, bring the centre of South Mansi island to bear E. by S. and steer for it; when the west end of North Mangsi bears E.N.E. steer S.E., passing midway between the islands and Great reef.

NORTH COAST OF BALÁMBANGAN ISLAND.—**Siagut shoal**, lying 2 miles westward of Siagut point, the north extremity of the island, is a detached coral bank, $1\frac{1}{2}$ miles in length, with less than 6 feet water over some parts of it; by keeping in a depth not less than 14 fathoms this danger will be avoided.

Reefs and shoals extend more than three-quarters of a mile from Siagut point, and a 3-fathoms patch lies N.N.W., nearly $1\frac{1}{2}$ miles from it: vessels should, therefore, when rounding Siagut point give it a berth of 2 miles, or not come into less than 9 fathoms water.

Tiga islet, situated on the northern entrance of Banguay west channel, is low and covered with trees; it is a little over half a mile in length, a quarter of a mile in breadth, and is surrounded by reefs fairly steep-to extending more than a mile in a northerly, and about three-quarters of a mile in other directions. The south-east extremity of the reef is marked by an iron tripod beacon.

Patches of $2\frac{1}{2}$ and $3\frac{1}{2}$ fathoms lie in the fairway between Tiga island reef and a coral shoal, more than half a mile in diameter and having less than 6 feet water over some parts of it, lying $1\frac{1}{2}$ miles south-eastward of Siagut point.

Rifleman rock, a small coral patch with $1\frac{1}{2}$ fathoms, and 5 fathoms close-to, lies in the fairway between Tiga islet reef and the Banguay coast dangers, with the south end of Tiga islet bearing W. $\frac{3}{4}$ N., distant 2 miles. Westward of the rock are depths of 6 and 7 fathoms water in the fairway.

Buoy.—A black buoy surmounted by a white ball has been placed on Rifleman rock by the B. N. Borneo Co., but it is not to be depended on.

About midway between Rifleman rock and the north-west coast of Banguay are patches of $2\frac{1}{2}$ and 3 fathoms, on a bank about $2\frac{1}{2}$ miles in extent north-east and south-west within the 5-fathoms limit, and with a depth of 6 to 7 fathoms in the channel between them and the shore.

Labuan rock, of $1\frac{1}{2}$ fathoms, lies in the fairway about 2 miles S.W. $\frac{3}{4}$ S. from Rifleman rock, and one mile N. by W. of Manyangit point.

NORTH and N.E. COASTS OF BANGUEY.—**Samarang point** has a reef extending nearly three-quarters of a mile north-west of it on which there is a sand cay about 2 cables within its extreme. Nearly 2 miles south-westward there is an islet on the reef fronting the shore.

Between Samarang point and the north point of Banguey the coast recedes, forming two bays, each having a small stream running into it; the points and the sides of the western bay are fringed with coral extending one to 2 cables from the shore, but the head of it is a coral and sand beach: vessels may anchor in the entrance of the bay in 4 fathoms. The eastern bay, with the exception of a narrow boat passage, is blocked with coral, upon the outer part of which is a small islet.

The principal islands and dangers fronting the north and east coasts of Banguey, and bordering the south side of the Main channel, are as follows:—The limits of these dangers, and the greater part of the reefs and shoals in the vicinity of Balábac strait, are depicted on the chart by a pecked line, within which vessels should not pass.

North Guhuan islet is situated on a reef three-quarters of a mile in extent, nearly one mile off the north point of Banguey, and 5 miles eastward of Samarang point; there are no off-shore dangers westward of it. From North Guhuan a bank with less than 3 fathoms extends eastward parallel to the shore for about 4 miles, on which are two sand cays and reefs dry at low water.

Louisa shoal, composed of coral, with $1\frac{1}{2}$ fathoms water, is three-quarters of a mile in length; from its north extreme North Guhuan bears S. by W. $\frac{1}{4}$ W., distant $1\frac{1}{2}$ miles. Manyangit point, well open of Samarang point, leads northward of it.

Maggie reef, situated about 3 miles eastward of Louisa shoal, is about one mile in length, with a coral patch $2\frac{1}{2}$ cables in extent on its northern side, and many rocks just below water. The reef, which dries, lies with the western sand cay between it and the coast bearing S.S.W., distant 2 miles.

Black Watch rock, on which the British barque *Black Watch* is reported to have struck, in 1878, lies just within the danger line depicted on the chart, 2 miles north of Maggie reef.

From the position of this rock, as given by the master of the *Black Watch*, North Mangai island is well open westward of South Mangai island, bearing N. $\frac{3}{4}$ E., and the cay on Banguey Outer north-east reefs, S.E. $\frac{1}{4}$ E.

From the irregularity of the soundings near this suspected locality it is possible that coral heads may exist other than those shown on the chart.

East Guhuan islet, about a quarter of a mile in extent, stands on the west side of a coral reef, $1\frac{1}{2}$ miles in length, the northern part of which dries. About a mile N.N.W. of East Guhuan islet, lies a $1\frac{1}{2}$ -fathoms patch.

Banguay Outer N.E. reefs are a cluster of reefs separated from Maggie reef and East Guhuan islet by a channel, one mile wide, with depths of 7 to 10 fathoms; these reefs are $3\frac{1}{2}$ miles in length in a north-west and south-east direction, and a little over one mile in breadth, with a large central portion dry at low water. Upon the north-west extreme of the reefs is a sand cay, which is useful for pointing out the locality of these dangers, which lie 6 miles from the shore. Close to the edges of these reefs there are depths of 6 to 9 fathoms.

North hill, bearing southward of S.W. by W. $\frac{1}{2}$ W., leads northward, and the west extreme of North Mangai island in line with the west extreme of South Mangai, N.W. $\frac{3}{4}$ N., or westward of that bearing, leads eastward of these reefs.

BANGUEY EAST COAST and DANGERS.—The east coast of Banguay is fronted by dangers which extend off several miles; they consist, for the most part of extensive reefs, dry at low water, separated from each other by narrow channels.

Kahamkamman is a small islet 2 miles south-eastward of East Guhuan, on the north-west end of a coral reef about one mile in extent; the part surrounding the islet dries at low water.

Westward of this islet is a reef, about $2\frac{1}{4}$ miles in extent, having three islets, a sand cay, and several patches of reef dry at low water, upon it; Balundangan is the name of the south-westernmost and smallest islet. At one mile south-westward of Balundangan, and 3 cables within the edge of the reef fronting the Banguay shore, is an island about $1\frac{1}{4}$ miles in length, with the summit near its centre; this island lies rather more than half a mile off the coast, which is covered with mangrove.

Samson patches, three in number, have $3\frac{1}{2}$ to 4 fathoms on them; they lie eastward of Kahamkamman near the edge of the danger line marked on the chart; from the easternmost patch Kahamkamman bears W. $\frac{1}{4}$ N., 3 miles.

May Williams shoal, situated from $1\frac{1}{4}$ to 2 miles S.E. by S. from Kahamkamman island, is one mile in length with a least depth of 2 fathoms and steep-to at a short distance.

Latoan island, situated about $4\frac{1}{2}$ miles southward of Kahamkamman island, is an oval-shaped island, one mile in extent, the trees upon it rising to an apex near the centre. It is situated at the south-west part of a dry

See chart, No. 948 [2,601].

reef, which extends $2\frac{1}{2}$ miles eastward, and $1\frac{1}{2}$ miles northward of it. A large reef lies to the westward of Latoan, upon which trees are growing.

Outer Latoan patch is the easternmost of three isolated patches which lie off the north-east edge of Latoan island reef; it has a rock a few feet under water near its eastern edge, from which Latoan apex bears S.W. by W. $\frac{1}{2}$ W., and is distant $3\frac{3}{4}$ miles.

East Banguey patches are two small coral shoals with 2 and $2\frac{3}{4}$ fathoms, lying three-quarters of a mile and one mile, respectively, off the Bankawan reefs; from the outer one, Latoan summit bears W.N.W. distant $3\frac{3}{4}$ miles.

Bankawan island, situated about a mile from the east coast of Banguey, is an irregular shaped flat island, $2\frac{1}{4}$ miles in length, and $1\frac{1}{4}$ miles in breadth. Close to its east side is an island, with an islet off its north-east point; and a little more than a mile south-eastward of it, a small round island, from which a narrow tongue of sand projects three-quarters of a mile in a south-easterly direction. From the south point of Bankawan numerous small reefs extend for about two miles, which with the reef extending half a mile south-eastward of the tongue of sand, form the northern limit of Bankawan channel.

Boats only can pass between the various reefs comprising the Bankawan and Latoan islands group, but between them and the reef fronting the Banguey coast there is a deep water channel through which it is possible for small vessels to pass, although near the west point of Bankawan the channel is narrowed to little more than a cable by a small reef in the middle.

The space eastward of the reefs herein mentioned has not been completely examined, so that shallow patches not charted may exist.

BANGUEY SOUTH CHANNEL, leading from the China into the Sulu sea, is somewhat intricate, and requires careful navigation, being for the greater part of its length bordered by dangers, and with others near the fairway. The western entrance, about $1\frac{3}{4}$ miles wide, lies between Outer shoal and Molleangan islands off-lying the coasts of Borneo and Banguey respectively.

The southern limits of the channel are formed by the North-west and North Borneo dangers, South channel dangers, the reefs off the northern part of Mallawallé, Mallawallé Eastern dangers, and Fairway shoal. The northern limits of the channel are, the islands which lie close-to and appear to be part of the southern shore of Banguey, Carrington reefs, and South-east Banguey dangers.

A careful look-out aloft and with the sun in a favourable position is necessary for navigating the channel in safety. For directions, see p. 159.

Balábac Main channel is considered much safer than any of the Banguey or Mallawallé channels, and is therefore preferable.

ISLANDS AND DANGERS on northern shore.—**Molleangan island**, 466 feet high, situated $1\frac{1}{4}$ miles south-westward of the south point of Banguey, is $1\frac{1}{4}$ miles in length east and west and three-quarters of a mile in breadth, with reefs and rocks above water extending three-quarters of a mile in a north-west, west, and south-westerly direction; the south-east and north-east sides of this island are steep-to. Several reefs with rocks above and below water lie nearly midway between Molleangan and Banguey.

At one mile south-west of Molleangan, lies Little Molleangan island, from which dangers extend a third of a mile eastward, and three-quarters of a mile westward, with depths of 13 to 17 fathoms close to.

South coast of Banguey.—**Patanunam island**, three-quarters of a mile eastward of the south point of Banguey, is more than half a mile in extent, and 428 feet high; the summit is a useful object for determining a vessel's position when passing through the channel. The island is fringed by a coral reef projecting 2 cables from its south-west end, whilst off the north-east end a detached narrow reef extends nearly a mile in that direction.

Pagassan island, hilly in character, is about 2 miles in extent, and fringed by a reef which projects 3 cables from the southern part, with a rock awash at a cable beyond. Westward of the rock awash there are patches of 4 and 5 fathoms, the outer and most distant of which is situated one mile W. by S. $\frac{1}{2}$ S. from it.

Lampassan island lies three-quarters of a mile eastward of Pagassan, and is about 3 miles in length; from its southern and eastern points coral spits, dry at low water, extend to the distance of three-quarters of a mile.

Mitford harbour is situated on the south side of Banguey island, and within the islands just described. There are three entrances to it; the middle and principal, between Pagassan and the island westward of it, is less than one cable wide, and has depths of 7 to 10 fathoms. The western entrance and channel within has about 5 fathoms. The eastern passage is said to be nearly 2 cables wide, with depths of 7 to 8 fathoms, but this does not appear on the plan. H.M.S. *Plover* visited Mitford harbour in January 1898, when several uncharted dangers appeared to exist.

Beacons, made of the nibong palm, were reported to be erected on the reefs on either side of the middle and western channels, and on some isolated reefs in the harbour, but they must not be depended on.

Town.—The settlement of Mitford, formed by the North Borneo Company, is situated on the north shore of the harbour, with a pier

extending out to the edge of the reef which fronts it. It was abandoned in 1882, and no signs of its existence now remains.

Water.—The water supply is reported to be good.

At 8 miles from Mitford, at the foot of Banguey peak, is a German tobacco plantation, named Limbuak, on the river of that name, which discharges on the west coast of Banguey.

Directions.—Middle channel.—In steering for the entrance of the middle channel, the two patches one mile south-east of it must be avoided; the west extreme of Pagassan island bearing N.W. $\frac{1}{4}$ N. clears the 4-fathoms patch to the eastward; and the same point bearing N. by W. clears the 5-fathoms patch to the westward. The middle of the hill (663 feet in height) close behind Mitford, bearing N.W. leads through the centre of the middle channel, and midway between the palm beacons on the fringing reefs, should they exist; when inside the islands, steer for the end of the pier. See the caution on plan, No. 287.

The other entrances are not recommended.

South-east part of Banguey.—About half a mile eastward of Lampassan a point extends from Banguey towards the channel, forming one side of an inlet choked by reef, the other side being a peninsula forming the south-east end of Banguey. A short distance off the point, on the reef extending from it lie two islets, and from these a number of rocks, almost connected, extend in a S. by W. direction nearly $1\frac{1}{2}$ miles. The south-east extreme of Banguey is bordered by reef, beyond which and off the mouth of the inlet just mentioned lie two large patches, the outermost being a mile from the shore reef.

Carrington reefs, situated about $2\frac{1}{2}$ miles east-south-eastward from the east end of Lampassan, are composed of coral, for the most part dry at low water; they extend 4 miles in an east and west direction, and are one mile in breadth; at 4 cables from the north side of these reefs is a detached patch of $2\frac{1}{2}$ fathoms. Between this shoal and the dangers extending from the Banguey shore is a channel three-quarters of a mile wide, but which, as a matter of ordinary navigation, no vessel would require to use. It is, however, practically available for small steam-vessels, which may afterwards round the Carrington reefs and return into Banguey South channel; or they may proceed into the Sulu sea, either by the narrow and intricate passage between the shore reefs and those surrounding Bankawan and Latoan; or by Bankawan channel, a broader and much less intricate passage, separating the Bankawan and South-east Banguey dangers.

The main channel, however, lies between the Carrington reefs and those off the north part of Mallawallé island, and this channel only should be used by strangers, taking care not to near the former dangers under a

depth of 13 to 15 fathoms: the apex of Pagassan bearing W. $\frac{3}{4}$ N. leads close to the southward, and the east end of Lampassan N. by W. $\frac{1}{4}$ W. leads westward.

South-east Banguey dangers comprise an extensive group of reefs and shoals $10\frac{1}{2}$ miles in length, in an E. by N. $\frac{1}{4}$ N. and W. by S. $\frac{1}{4}$ S. direction, and nearly 5 miles in breadth, situated $1\frac{1}{2}$ miles eastward of Carrington reefs. The west end of the group is defined by two small isolated reefs, dry at low water and steep-to; a good look-out is essential when nearing them, and the same precaution will have to be observed when passing through the channel, as the reefs forming the southern edge of these dangers are all steep-to. A space about 2 miles in extent, at the eastern part of South-east Banguey dangers, is studded by a number of coral patches with from one to 5 fathoms water, and from the outer or eastern one, the summit of Latoan island bears N.W. by W. $\frac{3}{4}$ W., distant $9\frac{1}{2}$ miles.

Bankawan channel, separating Bankawan reefs from South-east Banguey dangers, is three-quarters of a mile wide at its narrowest part. The channel is nearly straight, and lies in a N.E. $\frac{3}{4}$ E. and S.W. $\frac{3}{4}$ W. direction, but it will be necessary to keep a good look-out for the reefs on either side: with proper precautions there will be no difficulty in taking a vessel safely through.

ISLANDS and DANGERS on southern shore.—N.W. and North Borneo dangers.—Lying off the north-west and north coasts of Borneo are a number of coral shoals, generally of small extent, some partially dry at low water, whilst others dry entirely, and two are marked by sand cays, which shine brightly in the sunlight. Those dangers only will be described which limit the channels proper for vessels to proceed by; to mention the others in detail would tend rather to confuse navigators, who can have no inducement to risk the safety of their vessels by venturing amongst them.

Outer shoal, the largest of these dangers, forms the south-west limit of Banguey South channel; it is about one mile in extent and steep-to, with about 6 feet water, and a patch which dries on its eastern side. From its north-west end the summit of Little Molleangan bears N.E. by N., and is distant $2\frac{1}{2}$ miles.

A sand cay, on the east side of a coral ledge nearly awash and steep-to, lies E. by S. $2\frac{3}{4}$ miles from the north-east extreme of Outer shoal.

Nearly mid-way between Outer shoal and this sand cay is a small coral patch with 6 feet water, and a depth of 15 fathoms around.

Another sand cay, in the centre of a coral ledge, lies one mile eastward of the former. These cays are useful as marking the limits of the

channel, on the Borneo side, and being composed of white coral sand, are conspicuous.

Nearly 3 miles E.N.E. from the eastern sand cay, is a 2-fathoms patch, with two ledges which dry, a short distance southward; from this shoal, which is the most northerly of the North Borneo dangers, the summit of Patanunam bears N.N.W. $\frac{7}{8}$ W., distant nearly 4 miles.

About $1\frac{3}{4}$ miles E. $\frac{1}{4}$ S. from the 2-fathoms shoal is the outer of two coral ledges lying close together, with Patanunam summit bearing N.W. $\frac{1}{4}$ W. distant 5 miles. A 3-fathoms patch lies 3 cables E.S.E., and a ledge of rocks distant a little over $1\frac{1}{2}$ miles in the same direction from these dangers; the latter is within a third of a mile of the reef fronting the Borneo shore to a distance of about 2 miles.

Dangers in the fairway.—Petrel rock is a narrow ridge of coral, about 40 yards in extent with 14 feet water and a depth of 12 fathoms close around. It lies with the south extreme of Molleangan island bearing N. 84° W., distant about $3\frac{1}{2}$ miles.

A patch of $5\frac{1}{2}$ fathoms lies about three-quarters of a mile eastward of Petrel rock, with Kalutan point bearing N. 60° W., and the hill 663 feet high, at Mitford, N. 14° W.

Ten-foot rock, the westernmost of the fairway dangers, is a coral head 70 yards in length, with a least depth of 10 feet, and 17 fathoms close around; it lies with Petrel rock bearing N.N.E. $\frac{3}{4}$ E., distant about 7 cables. As other dangers may exist here, the utmost caution should be used when navigating in this locality.

South channel dangers comprise six coral reefs lying in the fairway eastward of Petrel rock, with irregular depths between. Three of these reefs lie in an east and west direction, about half a mile apart: the two westernmost dry at low water; the other is a strip of coral nearly three-fourths of a mile in length, with a rock nearly awash at its eastern extreme. A $2\frac{1}{2}$ -fathoms patch lies S. by E. $\frac{1}{2}$ E. 6 cables, and another with the same depth N.E. by E., $1\frac{1}{2}$ miles from the rock nearly awash. Between the different dangers are passages which it is possible for vessels to pass through, but, as this would serve no useful purpose, it is advisable to consider these shoals as a dangerous group.

Clearing marks.—The apex of Molleangan island W. by S. leads northward of South channel dangers; the same object W. $\frac{1}{4}$ N. leads southward, and about 3 cables northward of Petrel rock.

Mallawallé island, about 7 miles distant from the south-east part of Banguay, and the same distance from the north extreme of Borneo, is of irregular shape, 5 miles in length in a north-westerly and south-easterly direction, and about 4 miles in breadth. The island for the most part

consists of ranges of hills from 400 to 500 feet high; but one range, towards the north-west end, attains the elevation of 562 feet. Close to the coast, on the west side, is West islet; North-west islet lies a short distance off the north-west end; and North islet, low and nearly one mile in length, almost joins the north part of the main island.

The island is fringed by a reef which extends nearly a mile in places from the east, north, and west points, and to about half that distance from its south point.

A sand cay is situated on a reef about a mile in length at nearly the same distance north-east of Mallawallé North islet, with patches east and west of it, forming the south side of Banguey South channel; *see* the chart. Another sand cay marks the west end of a reef at about a mile off the east end of Mallawallé island; N.N.W. $1\frac{1}{2}$ miles from this sand cay there is a narrow coral patch, half a mile in length, with 13 fathoms close around it.

MALLAWALLÉ EASTERN DANGERS comprise a large number of detached reefs and shoals which extend 10 or 11 miles in an easterly and south-easterly direction from Mallawallé. It is only the northern edge of these dangers, forming the eastern part of Banguey South channel, which require description, for there can be no object in risking a vessel amongst them.

About $2\frac{3}{4}$ miles N.E. by E. from the sand cay off the eastern end of Mallawallé island is a coral reef which dries, and has depths of 14 and 15 fathoms close around. One-third of a mile southward of this reef is a reef half a mile in extent, with less than 6 feet water over it. A cluster of reefs, occupying a space $1\frac{1}{4}$ miles in extent, with 13 fathoms close to on the northern side, lies a mile eastward of the coral reef just described; and E. by N. $\frac{1}{2}$ N., $3\frac{1}{2}$ miles from the same danger is a reef half a mile in length, with 7 feet water on its northern end. This danger, being always covered, is not so readily seen as the others, and it is important to bear this in mind, as the shoal occupies a prominent position, bordering as it does on the deep water of Banguey South channel.

The Straggler, a small coral islet, with trees 20 feet high, is a useful object for assisting in the navigation of the eastern part of Banguey South channel. From it the 7-feet reef just described lies N.W. by W. $\frac{1}{2}$ W. nearly $1\frac{1}{2}$ miles, while westward of the islet are several other dangers. The reef surrounding the islet extends $1\frac{1}{4}$ miles in an easterly direction, and more than half a mile south-westward. About $1\frac{1}{2}$ miles S.E. from the east extreme of Straggler reef, and E. by S. $\frac{1}{4}$ S. from the islet is the outer edge of a reef having in some places less than 6 feet water; half a mile eastward of it is a $3\frac{1}{4}$ -fathoms coral patch. Other dangers of the group extend 7 miles further to the southward.

See chart, No. 948 [2,601].

Fairway shoal, at the eastern entrance of South Banguay channel, is three-quarters of a mile in diameter, with a rock awash near its southern part, from which Straggler islet bears S.W. $\frac{1}{2}$ S., distant $2\frac{1}{2}$ miles. The rock awash is, however, only $1\frac{1}{2}$ miles from the eastern extreme of Straggler reef, which limits the width of the channel southward of Fairway shoal; the channel northward of the shoal is 3 miles wide. At $1\frac{1}{2}$ miles eastward of Fairway shoal there is a patch of $3\frac{1}{4}$ fathoms, half a mile in extent, with deep water around.

Directions for Banguay South channel.—Attention to these directions must be supplemented by a vigilant and careful look-out from aloft. The best time for proceeding through from the westward is with the sun astern, when there is seldom much difficulty in making out the various dangers as the vessel advances. Balábac Main channel is, however, considered a safer route.

Having rounded Kalampunian island off the north-west extreme of Borneo, steer for Molleangan islands bearing about East, and when about 5 miles from the reef encircling them, edge south-eastward, opening the summit of the larger island southward of the smaller island. Then steer to pass about three-quarters of a mile southward of the latter; observing that the whole of Patanunam island should not be opened eastward of Molleangan island, until the summit of Little Molleangan bears N.N.E., which will lead clear of Outer shoal. Having passed Little Molleangan, steer more to the north-eastward, keeping within a mile of Molleangan and Patanunam.

Having passed those islands, bring the peak of Patanunam to bear W. $\frac{3}{4}$ S. and steer E. $\frac{1}{2}$ N. through the fairway between the South channel dangers and the rock off the south end of Pagassan, until the sand cay off the north side of Mallawallé island is abeam, distant about a mile; when an E. by S. $\frac{1}{2}$ S. course will lead clear of the dangers off the northern side of Mallawallé. When the sand cay off the east extreme of that island bears South, distant $2\frac{1}{4}$ miles, steer E.N.E., which course being preserved will lead one mile northward of Fairway shoal, into the Sulu sea. Bearings of Straggler island will check the position of the vessel whilst westward of Fairway shoal.

Mæander patch.—This dangerous reef, composed of coral and sand, with $1\frac{1}{4}$ fathoms water, is nearly half a mile in extent and steep-to; it is situated about 6 miles eastward of Fairway shoal, and N.E. by E. $\frac{1}{4}$ E., $17\frac{1}{2}$ miles from the north-east point of Mallawallé island.

About a mile westward is a patch of 3 fathoms, and the same distance eastward one of 6 fathoms; there are also small patches of 4 fathoms south of Mæander reef at the distance, respectively, of 2 and 4 miles.

See charts, Nos. 948 [2,601] and 287 [2,598].

The Pudsey Dawson dangers are a series of coral patches, the westernmost of which, with $2\frac{1}{2}$ fathoms, lies E. $\frac{1}{2}$ S. 19 miles from the east end of Mallawallé island; from this patch for about 16 miles in an east-north-east direction, there are several banks, principally coral and sand, with from $2\frac{1}{2}$ to 10 fathoms upon them, and deep water between.

Detached shoal patches.—Northward of Pudsey Dawson dangers and of Mæander patch, to the parallel of lat. $7^{\circ} 25' N.$; and between the meridian of long. $117^{\circ} 50' E.$ and the dangers, already described, lying eastward of Banguey island, there are numerous coral patches dangerous to navigation. Many of these have depth of from $3\frac{1}{2}$ to 5 fathoms, and the space within the above approximate limits should be avoided by vessels when possible; *see* chart.

The Muligi patches consist of a number of coral banks, extending about 7 miles east and west, upon which the ascertained depths are from 5 to 10 fathoms; the easternmost of these patches, with 8 fathoms, lies W. $\frac{3}{4}$ N. from the larger Muligi island. There may be less water on some patches and numerous reefs are reported to lie westward of them.

Wanderer shoal, about 13 miles southward of the Muligi patches, is about 2 miles in extent and has a depth of 2 fathoms, or less, at its south-east end, situated in lat. $6^{\circ} 42' N.$, long $118^{\circ} 6' E.$

Minna reef, about $3\frac{1}{2}$ miles in length north-west and south-east, and three-quarters of a mile in width, with a depth of half a fathom at each end and $1\frac{1}{2}$ fathoms between, lies with its north-west extreme situated N.E. by E. distant 8 miles from Tigabu island.

Schuck reef, one mile in extent and with a depth of $3\frac{1}{2}$ fathoms, is reported to be situated in lat. $6^{\circ} 49' N.$ long. $117^{\circ} 52' E.$

The space included between the Pudsey Dawson dangers, Muligi patches, Minna reef, Billeau dangers (*see* p. 164), and Schuck reef has not been examined; this area is reported to contain numerous reefs with from one to 2 fathoms water. *See* pecked line on chart, within which no vessel should enter.

MALLAWALLÉ CHANNEL.—Dangers extend 3 or 4 miles off from the north-east coast of Borneo, and between these and Mallawallé island there is a channel $2\frac{1}{2}$ miles in width.

Egeria rocks, about 2 cables in extent, covered by 3 feet water, and with a depth of 9 fathoms close around, lie S.W. by W., distant $2\frac{1}{2}$ miles from the islet north-west of Mallawallé, with the south extreme of the island bearing E. by S. $\frac{3}{4}$ S.

Coast.—The north-east coast of Borneo, between Silk island in Mallawallé channel, and Sandakan harbour, is generally low, densely wooded, intersected by numerous rivers and streams, and for a considerable distance from the shore the water is shallow and abounds with coral reefs.

See charts, Nos. 287 [2,598], and 948 [2,601].

As it would be impracticable from any mere written description to navigate with safety among the numerous dangers which lie eastward of Mallawallé island, it will be sufficient to describe the principal dangers, the appearance of the various islands and objects which present themselves as marks, and the routes usually adopted by mariners acquainted with the coast; for further information the charts must be referred to.

Lin-gi-san is a small rocky reef, with a head 30 feet in height, lying about N.N.E. $\frac{1}{2}$ E., distant $1\frac{3}{4}$ miles from the north-east point of Bankoka.

Passage reef.—At the distance of about 2 miles south-westward of the south end of Mallawallé island, and $1\frac{1}{4}$ miles N.E. by N. of Lin-gi-san rocks, lies Passage reef, awash at low-water spring tides, and easily distinguished; it may be passed on either side, but the route recommended lies northward.

Another reef, awash at low water, on which is a small sand cay, is situated $2\frac{3}{4}$ miles E. $\frac{3}{4}$ S., of Passage reef.

Fly rock, on the southern side of the Mallawallé channel, awash at low water, and about $1\frac{1}{2}$ cables in extent, lies E. by N. $2\frac{1}{4}$ miles from Lin-gi-san, and is distant $1\frac{1}{2}$ miles S.W. by W. $\frac{3}{4}$ W. from the sand cay above.

Southward of Fly rock and separated from it by a narrow channel there is a coral reef about a mile in extent, parts of which dry at low water.

Clearing marks.—Banguet peak in line with the west extreme of West island (Mallawallé), bearing N.W. $\frac{3}{4}$ N. leads between Passage reef and the cay eastward of it; and Kukuban island on with the north end of Tigabu island leads between Fly rock and the cay above mentioned.

Mandiralla, an island about half a mile in length east and west, is surrounded by a coral reef, which extends to a distance of about 6 cables on the north side, and for a mile eastward; it lies 6 miles southward of the eastern end of Mallawallé island. Mandiralla is densely wooded, the tops of the trees being 144 feet above the sea.

Foul ground extends about $3\frac{1}{2}$ miles E.S.E. of Mandiralla.

Bankoka hill is a conspicuous wooded hill, 587 feet in height, on the mainland west-south-westward of Mandiralla.

Tanj Bungan is a thickly-wooded island of considerable extent lying about 4 miles south-east of Bankoka hill.

Bush island is a sand cay on which are a few bushes, the tops of which are about 10 feet high; it stands near the middle of a coral reef about $1\frac{1}{2}$ miles in length in a north-east and south-west direction.

Foul ground.—Much foul ground exists between Mandiralla, the coast of Bankoka, Tanj Bungan, and Bush island.

See chart, No. 1,650 [2,604].

Kukuban is a sand cay situated on the south-west part of a coral reef, about half a mile in diameter, lying 4 miles East of Mandiralla; it is covered with trees 70 feet high.

Rocks.—Between Kukuban and Tigabu island situated $4\frac{1}{2}$ miles south-eastward, there are the following dangers lying near the recommended track through the Mallawallé channel, and much caution is necessary when navigating in the neighbourhood:—

A rock, situated S.E. by S., distant $1\frac{1}{6}$ miles from Kukuban, nearly awash at low water and marked with a beacon surmounted by a black spherical cage. A rock lying S. by E. $\frac{5}{8}$ E., 2 miles from Kukuban, nearly awash at low water but difficult to see. Merlin rock, apparently nearly awash at low water and dark coloured, situated 7 cables east of the rock marked by the beacon. A sand cay on a coral reef 3 cables in extent, and a coral patch of nearly the same dimensions lying respectively $1\frac{1}{2}$ miles E. by S. $\frac{1}{4}$ S., and $2\frac{1}{4}$ miles S.E. by E. from Kukuban; these are easily made out from the mast head.

Tigabu is an island about one mile in length, and densely wooded, the tops of the trees being 227 feet high. Reefs extend about 3 miles in a north easterly direction from Tigabu island, and two-thirds of a mile north-westward.

Tibakkan, situated about $2\frac{1}{2}$ miles north of the west point of Tigabu island, is a sand cay covered with trees 108 feet high. Dangers extend $1\frac{1}{2}$ miles in a north-easterly direction from this island.

Two coral reefs, about a mile in extent, lie $1\frac{1}{2}$ miles north-westward of Tibakkan, on the north-east side of the track recommended through the Mallawallé channel.

Tambulian (with bushes 12 feet high), **Bu-a-ning**, and the adjacent reefs (including the two coral reefs just described), form the south-eastern boundary of the Mallawallé eastern dangers.

Mosquito rock, about one cable in extent, with a depth of 3 feet, and steep-to, lies N.E. $\frac{1}{2}$ N. $2\frac{1}{4}$ miles from Tibakkan island.

NORTH-EAST COAST of BORNEO and OFF-LYING ISLANDS.—The coast between Bankoka hill and Simaddel or Jambongon island, 13 miles south-eastward, has not been surveyed. From the north-east point of Simaddel the coast trends about south-east for 26 miles to Tanjong Siasib, and then turns south to Labuk bay. The off-lying islands and reefs, between which a vessel must pass on her way from Mallawallé channel, were surveyed in 1881 by H.M.S. *Flying Fish* to a distance of from 13 to 18 miles from the shore; beyond this distance there is the unexplored region extending northward to Pudsey Dawson dangers, *see* p. 160.

N.E. and S.W. Bluffs are two prominent headlands, both apparently being on the west coast of Simaddel, but the limits of this island are not defined. The former is 442 feet in height, and the latter somewhat less.

From the coast of Simaddel island, reefs and dangers extend north and north-east to a distance of about $5\frac{1}{2}$ miles and eastward for 9 miles. On these reefs are many sand cays, two of which, Mabahök and Kalangaan, are especially conspicuous, being covered with trees whose tops are about 80 feet above the sea.

Sipindung is a sand cay covered with bushes, the tops of which are about 20 feet high; it lies $4\frac{1}{2}$ miles E. by S. $\frac{1}{4}$ S. from Tigabu; and is at the west end of a coral reef about half a mile in extent. Dangers extend three-quarters of a mile south and south-west of this islet, $2\frac{1}{2}$ miles in a N.N.E. direction, and $1\frac{1}{2}$ miles to the north-west.

Between the Sipindung dangers and the reefs projecting eastward from Tigabu, there is a clear passage $1\frac{1}{2}$ miles in width.

South-west of Sipindung, at the distance of $1\frac{1}{2}$ miles, there is a group of reefs about half a mile in extent; between these and other dangers also south-west of but nearer to Sipindung, there is a clear passage nearly three-quarters of a mile in width, through which lies the track from Mallawallé channel.

A small shoal, with less than 6 feet water, lies between the above group of reefs and the reefs extending from Simaddel island.

Sandy island is a small sand cay which sometimes covers, and is near the middle of a coral reef about half a mile in extent, off which detached patches extend half a mile westward; it lies about $4\frac{1}{2}$ miles S.E. by E. of Sipindung, and between, at the distance of $2\frac{3}{4}$ miles in a W.N.W. direction from Sandy island, there is a coral reef about a third of a mile in extent.

Beacon.—Sandy island is marked by a skeleton tripod beacon, 35 feet in height, painted red and black, with a basket cage on its summit.

Coral patches.—Three-quarters of a mile south-east of Sandy island is a coral patch of 4 fathoms. Another small patch of 4 fathoms lies $1\frac{1}{4}$ miles S.W. $\frac{3}{4}$ W. from the beacon, and a patch of 7 fathoms S.W. $\frac{1}{2}$ S. one mile from it; the track from Mallawallé channel lying between.

Leonan is a sand cay 5 miles S. $\frac{3}{4}$ E. of Sandy island, which also sometimes covers. It is situated on, and about one mile from the north-east end of an extensive chain of reefs which at this part extend 8 miles E.N.E. from the shore of Simaddel island.

A small 2-fathoms patch lies 2 miles north-west of Leonan.

Reefs.—Beacon.—At the distance of nearly 3 miles, N.E. by E. $\frac{1}{4}$ E. from Leonan cay there is a small coral reef, marked by a beacon consisting

of an iron perch surmounted by a black cage. Between this reef and that on which Leonan cay is situated there is a clear channel nearly 2 miles in width.

At about one mile N.E. by N. from the above beacon is the south-west end of some coral patches, that dry, which extend north-eastward to the distance of about one mile.

A rock covered by less than 6 feet water, and with $4\frac{1}{2}$ fathoms seaward of it, is situated eastward of the entrance to Paitan river, and 6 miles S. $\frac{1}{2}$ E. from Leonan. A reef, dry at low water, lies $1\frac{1}{2}$ miles S.E. by S. from this rock; and three similar reefs trend south-westward for a distance of $2\frac{1}{2}$ miles from the rock.

Billean, situated 12 miles south-eastward of Leonan cay, is a sand cay on which there are a few bushes, about 38 feet high. It is surrounded by coral reefs and dangers which extend in a north-easterly direction from it to the distance of nearly 4 miles.

Billean North dangers.—Eight miles northward of Billean, and about the same distance eastward of Leonan cay, is a group of coral reefs, about 4 miles in extent, upon which the least known depth is $1\frac{1}{2}$ fathoms. As these dangers have not been completely examined they should be carefully avoided.

Billean South dangers is another scattered group of coral reefs lying E.N.E. of Billean cay, distant 7 to 11 miles; they consist of the following:—A small $2\frac{1}{2}$ -fathoms patch, situated 9 miles N.E. $\frac{1}{2}$ E. from Billean cay; a 3-fathoms patch, lying E. by N. $\frac{3}{4}$ N. 7 miles from Billean, with a similar shoal of 3 fathoms a mile farther in the same direction; a patch of $3\frac{1}{2}$ fathoms, situated E. by N. from Billean and N. $\frac{3}{4}$ E. $7\frac{1}{2}$ miles from Lankayan island; and Packnam shoal, with less than 3 fathoms, in lat. $6^{\circ} 40' N.$, long. $117^{\circ} 56\frac{1}{2}' E.$ All these shoals are steep-to, but may have less water upon them.

Tagipil is a densely wooded and conspicuous small island situated $4\frac{1}{2}$ miles S.W. $\frac{3}{4}$ S. of Billean cay; the tops of the trees are 184 feet high.

Bankuruan cays are two small sand cays covered with trees about 50 feet high. Billean, Tagipil, Bankuruan, and the mainland are almost connected by a chain of coral reefs.

Five miles S.S.E. $\frac{3}{4}$ E. from Billean is a sand cay, about 4 feet high, standing on a coral reef about half a mile in extent.

Lankayan, about 11 miles south-eastward of Billean cay, is a sand cay covered with trees 100 feet high, and is surrounded by a coral reef, which extends about $1\frac{1}{2}$ miles southward, three-quarters of a mile northward and eastward, and has a $3\frac{1}{2}$ -fathoms patch at half a mile farther in the latter direction. A small detached coral patch lies $1\frac{3}{4}$ miles N. $\frac{1}{4}$ E.

from the cay. The depths for about $4\frac{1}{2}$ miles north-north-eastward of Lankayan are irregular, there being several patches, each about half a mile in extent, upon which the depths are from 3 to 5 fathoms, with about 12 fathoms between them.

Shoal ground, with depths of $3\frac{1}{2}$ to 4 fathoms, and 12 fathoms around, extends W.S.W. 2 miles from Lankayan; and there is foul rocky ground one mile in extent N.E. by N. and S.W. by S., with depths of about one fathom lying with its farther extreme S.W. by S., distant 3 miles from the cay. This shoal is a danger situated near the track of vessels passing westward of Lankayan.

Four miles westward of Lankayan island there is a steep-to coral reef, about a mile in extent N.N.E. and S.S.W., the southern half of which dries.

Two shoals, with depths of $1\frac{1}{2}$ fathoms and 8 to 10 fathoms around, and together about one mile in extent north and south, lie with their northern extreme S.W. $\frac{3}{4}$ S., distant $6\frac{1}{2}$ miles from Lankayan.

Kestrel shoal, about half a mile in extent and with a depth of 2 fathoms near its centre, is situated 4 miles East of Lankayan.

Kechil rock, a coral patch about 3 cables in extent, with a depth of $4\frac{1}{2}$ fathoms and deep water around, lies N.E. $\frac{1}{2}$ E. 7 miles from Lankayan island.

Bo-aan, 192 feet high, the northernmost of a chain of islands which run in a N.N.E. direction from the mainland, is about one mile in length north-east and south-west; it is surrounded by a coral reef about one-third of a mile wide, and has its lower parts densely wooded.

Si-ba-ung is a small coral reef lying W. $\frac{1}{2}$ N., distant $4\frac{1}{2}$ miles from the north part of Bo-aan island. There are a few bushes 35 feet high on this reef.

Flying Fish rock, of small extent with deep water around, lies $2\frac{1}{2}$ miles east of Bo-aan island, and has $2\frac{3}{4}$ fathoms on it at low water.

Lihiman lies $2\frac{1}{2}$ miles south of Bo-aan island, is about three-quarters of a mile in length north-east and south-west, densely wooded, and 172 feet in height. Lihiman island is surrounded by a coral reef which extends north-eastward about three-quarters of a mile, and has upon it a small islet 30 feet high.

Both Lihiman and Bo-aan are mud volcanoes, which appear to have been active within the last few years.

Langaan is a small wooded island 120 feet high, situated on the south-west edge of an extensive coral reef, projecting $1\frac{1}{2}$ miles north-eastward. A coral patch, apparently of small extent, having a depth of 4 fathoms and possibly less, lies E. by S. $\frac{3}{4}$ S. $4\frac{1}{2}$ miles from Langaan island.

Johnston rock, a coral patch of $2\frac{1}{2}$ fathoms, situated N.E. by E. $2\frac{3}{10}$ miles from the south-east extreme of Langaan, lies near the middle of shoal ground with depths under 10 fathoms, extending about a mile in an E.N.E. direction.

Great and Little Bakkungaan are two wooded islands, fringed with coral, 190 and 157 feet high, lying respectively about 2 and 3 miles south-westward of Langaan.

Detached coral reefs extend from Great Bakkungaan north-westward $1\frac{1}{2}$ miles, and westward and south-eastward to the distance of a mile. A coral patch with 8 feet water over it is reported to exist in the channel between Great Bakkungaan and Langaan.

Silingaan is a small wooded island 139 feet high, fringed with coral to the distance of a quarter of a mile, lying 3 miles southward of Lihiman. About one mile east of Silingaan is a coral reef, half a mile in extent, on which is a sand cay, awash at high water.

Gulisaan is a small islet on the south edge of a coral reef three-quarters of a mile in extent east and west, and lies about $1\frac{1}{4}$ miles S. by W. of Silingaan; on it is a clump of conspicuous trees 76 feet high.

Libarran is a wooded island, 140 feet high, about $1\frac{1}{4}$ miles in length, E.N.E. and W.S.W., lying 3 miles northward of Tanjong Pandaras, and about the same distance within the 3-fathoms contour-line. From it a coral reef extends eastward $1\frac{1}{2}$ miles, with a black rock 8 feet high near its end; and also westward for two-thirds of a mile, having a small round islet close to its extreme.

Clotilde rock, in lat. $6^{\circ} 14' N.$, long. $118^{\circ} 23\frac{1}{4}' E.$, is a small coral reef, part of which stands 2 feet above high water; there is about 20 fathoms of water close to around it.

Laurel rock is of small extent, stands 6 feet above high water, and is situated in lat. $6^{\circ} 9\frac{1}{4}' N.$, long. $118^{\circ} 29' E.$

Baguan is a densely wooded island 228 feet high, lying S.S.W. $\frac{1}{2}$ W. $3\frac{1}{2}$ miles from Laurel rock. From the north point of it, discoloured water has been seen to extend a considerable distance in the direction of Laurel rock, the passage between Baguan and the rock should therefore not be taken.

Taganak.—This island, 554 feet in height, is about one mile in length N.N.E. and S.S.W., and is surrounded by a coral reef to the distance of about 4 cables; it is densely wooded. Strong currents are reported to exist in its vicinity.

Taganak patches, of from 5 to 10 fathoms, with greater depths between them, are about $2\frac{1}{2}$ miles in extent in an E. by N. and opposite direction, and lie with the central and shallowest part W.N.W., distant

4 miles from the south-west end of Taganak island. This position is occasionally marked by tide ripples.

Gubbins rock is a dangerous patch of coral with about 6 feet water on it and steep-to, lying 7 miles W. $\frac{1}{2}$ S. from the south point of Taganak island, and S.E. $\frac{1}{2}$ S. $7\frac{3}{4}$ miles from Little Bakkungaan.

LABUK BAY.—Labuk bay, situated about 20 miles north-westward of Sandakan, is about 19 miles wide between Tanjong Pandaras and Pulo Pura-pura, and about 16 miles in depth to Labuk river in the south-west corner of it. The north-west part of the bay is shallow, and blocked by numerous sand banks, which renders the navigation of that part dangerous even for boats; the south-eastern side is somewhat deeper, affording a passage to Labuk river. The western side of the bay is densely wooded, with numerous creeks; and the south-east side is fringed by islets and rocks extending some distance off shore.

From Tanjong Niug, a well-defined point covered with trees, about 150 feet high, just southward of Pulo Pura-pura on the north-west side of the bay, the coast trends north for about 12 miles to Tanjong Siasib. It is wooded with casuarina trees, which in some places form peculiar clumps.

About 8 miles north-westward of Tanjong Niug are Quoin and Flat hills, 650 and 630 feet high respectively.

Islets.—A chain of islets, of which Torongohok is the northern, lie in the south-western part of the bay. The northern portion of Torongohok is wooded with casuarina trees about 140 feet in height, forming a prominent object when approaching from the north-eastward.

Pulo Gusong is a small sandy islet about 2 feet in height on the eastern extremity of a large sand-bank near the middle of the bay, and being devoid of trees is difficult to distinguish. Off Tanjong Pandaras are some low islets, merely clumps of mangroves on the fringing reef.

Pulo Tikus is a wooded pyramidal island, 234 feet in height, lying one mile westward of Tanjong Pandaras; about half a mile northward of it there is a small rock nearly awash at high water.

LABUK RIVER.—The mouth of Labuk river is 20 miles south-westward of Tanjong Pandaras; the entrance is $5\frac{1}{2}$ cables wide, with a depth of 5 fathoms. The Bongaya river and several streams of no importance to trade enter the sea in the north-west portion of the bay.

Bar.—The best channel to Labuk river is between Libarran island and the low islets off Tanjong Pandaras; the least water is on the bar between Gusong islet and Sungei Gum-gum on the south-eastern side of the bay on which there is a depth of 9 feet.

Directions.—From the eastward, having passed Gubbins rock, course must be shaped to pass between Libarran and the low islands off Tanjong Pandaras, avoiding the rocks which lie off the reef extending about half a mile southward of Libarran island; and when Round islet (westward of Libarran) is in line with Gulisaan, bearing N.E. by E., course must be altered to S.W. by W. These islets in line astern, lead clear and westward of the islets and rocks off Tanjong Pandaras, and the same course continued, allowing for tide, leads over the flats, in 9 feet at low water springs. When the water deepens course may be shaped to pass about three-quarters of a mile westward of Semawang point, from whence to the mouth of Labuk river there is a depth of from $3\frac{1}{2}$ to 5 fathoms.

Tides.—It is high water, full and change, in Labuk bay at 9h. 30m. during the period of the south-west monsoon in the China sea; springs rise 8 feet, neaps 5 feet. The maximum strength of the ebb observed in the river was 3 knots.

Supplies.—There is a village on Pulo Tetabuan and another on Pulo Linkabo, but no supplies were obtainable, neither was any fresh water met with.

COAST.—From Tanjong Pandaras the coast takes a S.E. by S. direction for 16 miles to Sandakan harbour, and thence it trends E.S.E. for about 60 miles to Tanjong Unsang, whence it gradually turns southward for about 11 miles to Dent haven. This coast is covered with thick jungle, principally casuarina trees from 150 to 180 feet high, fronting low, swampy land, with a narrow sandy beach.

Nunuyon Laut and Nunuyon Derat are two low wooded islands lying about 2 miles north-west of Bahala; they are almost connected with the mainland, and are about 3 miles within the 3-fathoms contour-line.

Bahala is an island about 2 miles in length, north and south, lying on the north-west side of the entrance to Sandakan harbour. The northern part of it is low, the southern rises in two conspicuous hills, 643 and 544 feet in height; these hills slope gradually to the westward, but their eastern faces are imposing precipices with two light red streaks running perpendicularly from the top to the bottom, by which the island may be recognised.

SANDAKAN HARBOUR.—This magnificent harbour is $1\frac{1}{2}$ miles wide at the entrance, between Bahala island and the broad point opposite to the south-east. From here it gradually increases in width, forming a spacious basin north of Pulo Bui, more than 3 miles in diameter, which constitutes the usual anchorage. The harbour extends south and west of Pulo Bui to a distance of 15 miles from the entrance, and large sailing

vessels proceed as far as German Town, on the island of Timbang, 11 miles up the bay, to load timber; but the only part surveyed is that north of Pulo Bui, and the bay of Sapa Gaya, situated on the southern shore. From the entrance to the end of Sandakan bay the depths vary from 16 to 3 fathoms.

Some thirteen rivers run into the bay, and a bar has formed 6 miles from the entrance with a depth of 4 fathoms at low water.

The eastern side of the harbour entrance is formed by a large island, low and densely wooded, and separated from the main coast by a channel named Trusan Duyou. From the shore eastward of the entrance an extensive flat projects seaward, the northern point of which, in a depth of 3 fathoms, lies 8 miles north-east of the west entrance point; the 15-fathoms limit is 2 miles farther out.

The cliffy hill on the eastern side of Bahala bearing S.W., leads over the flats in the approach to Sandakan harbour in a depth of not less than 4 fathoms, and $1\frac{1}{4}$ miles northward of the shoal projection from the south-eastern shore.

The northern shore is hilly: two of the hills are very conspicuous from seaward; one on Tanjong Papat, the point south-west of Bahala, being 674 feet high; the other, a three-peaked hill, is 844 feet in height. Both of these hills, like Bahala, slope gradually on the western side, and are somewhat precipitous on the eastern face.

Atjeh rock, with $2\frac{1}{2}$ fathoms at low water, and the only detached danger off Elopura, lies $3\frac{1}{2}$ cables E. by S. $\frac{3}{4}$ S. from the end of the wooden pier; it is marked by a buoy chequered red and white, moored off its southern side.

North-west of Atjeh rock, about midway between it and the shore, there is a patch of $3\frac{1}{4}$ fathoms.

Elopura, the principal town and head-quarters of the North Borneo Company, is built on the north shore of Sandakan harbour, three-quarters of a mile within Tanjong Papat. The commercial town is on terra firma, but the Malay town is built on piles over the water. At the census taken in 1887 the population amounted to 3,312, of whom 31 were Europeans.

Communication.—Frequent communication is kept up between Elopura and the other ports of North Borneo, and with Singapore and Hong Kong by steam vessels, but the service is irregular.

One of the Singapore steamers runs on from Sandakan about once in three weeks to Darvel bay, calling at Lahat Datu, Silam, and Simporna, touching again at Sandakan on her way back to Singapore.

Telegraph.—Sandakan is in telegraphic connection with Mempakol, and thence via Labuan with Hong Kong, Singapore, and Europe by submarine cables. It is proposed to connect Darvel bay, Gaya bay, Ambong bay, and Kudat harbour with this line.

Pier.—There is a substantial wooden pier alongside which vessels drawing 14 feet can lie ; it is 480 feet in length, and 20 feet wide, with a **T-head** 150 feet long.

LIGHTS.—Harbour lights, *red and green, fixed*, are exhibited at the end of the pier at Elopura.

Anchorage.—The most convenient anchorage is about half a mile southward of the town in a depth of 8 fathoms, mud.

Tides.—It is high water full and change in Sandakan harbour at noon ; springs rise $6\frac{3}{4}$ feet, neaps one to 4 feet.

Trade.—Most of the trade is carried on through Singapore with Great Britain and the Colonies. The exports comprise mostly jungle produce, wax, cocoanuts, gutta-percha, sago, tobacco, rattan, and india-rubber. The imports include cloth, hardware, manufactured goods of all kinds, rice, oil, sugar, and opium.

Supplies.—Coal.—About 200 tons of coal is usually kept in stock ; it is principally Labuan coal from the North Borneo Company. Beef and bread may be obtained here ; fish is plentiful. Water is abundant in the town, but there are no means of getting it off to the shipping.

Repairs.—There is a good flat beach of hard sand off the town on which small craft might be beached for repairs. Chinese carpenters are available.

Timber.—There is a large supply of timber here, the uncleared land being covered with forest containing very fine trees.

DIRECTIONS.—Mallawallé channel to Sandakan.—The route now generally used by vessels proceeding to Sandakan is by the Balabac Main channel (*see* page 147), that by the Banguey South channel and the Mallawallé channel being practically abandoned on account of the numerous charted and uncharted dangers existing in it.

Should, however, the Mallawallé channel be used, the track recommended lies midway between Mallawallé island and Passage reef, and passes about 3 cables northward of the cay (awash at low water) situated $2\frac{3}{4}$ miles eastward of the latter. Hence to Tigabu the track lies either eastward of Kukuban island and the shoals south-eastward of it, or westward of this central group, until $1\frac{1}{2}$ miles south-westward of Tigabu, when Sipindung island may be steered for bearing East, until Tigabu north-east extreme is in line with the west extreme of Mallawallé island. This latter mark leads between the shoals extending to the southward of Sipindung and the shoal waters off the north-east edge of the small coral reef situated $1\frac{1}{2}$ miles S.W. from that island.

Another good mark leading through this, the narrowest part of the channel, is a sand cay with a few bushes on it lying one mile northward of Tigabu island, in line with the eastern summit of Mallawallé island N.W. $\frac{3}{8}$ W.; which mark also leads past Sandy island and between the Leonan reef and the detached reef north-eastward of it marked by a beacon.

Billean island should be rounded at a distance of from $4\frac{1}{2}$ or 5 miles, and the course be then altered to pass about $2\frac{1}{2}$ to 3 miles west of Lankayan, between that island and the reef lying $3\frac{3}{4}$ miles west of it; foul ground extends south-westward 3 miles from Lankayan, and special care is required at this part. The track now lies eastward of Si-ba-ung, and of the reef extending $1\frac{1}{4}$ miles east of Silingaan; and westward of Lihiman, Little Bakkunga, and the dangerous Gubbins rock situated $7\frac{3}{4}$ miles S.E. $\frac{1}{2}$ S. from the last-mentioned island.

CAUTION.—The route above is marked on the chart and has been followed with safety, but there may be less water than shown on some of the shoals and in such reef-strewn waters other dangers not charted may exist.

It should be borne in mind also, that no reliance can be placed on the position of sand cays which have no vegetation on them; the action of the sea frequently causes them to shift considerably, and even disappear.

The beacons are difficult to make out, and are liable to be washed away.

Tides.—At Tigabu, it is high water, full and change, at 11h. 38m.; springs rise $6\frac{1}{2}$ feet; neaps vary between 9 inches and $2\frac{3}{4}$ feet, and are exceedingly irregular.

In the Mallawallé channel the flood runs to the eastward and the ebb to the westward at springs with a velocity of about $2\frac{1}{2}$ knots.

On the coast between Mallawallé and Sandakan, no regular tidal stream was perceptible, but when the north-east monsoon blew steadily there appeared to be a constant set to the N.W.

COAST.—Between Sandakan and Kinabatangan river, situated in an east-south-east direction, the coast is intersected by numerous streams, some of which are said to lead into the river and to be navigable for boats.

Landmarks.—About 11 miles eastward of Sandakan there is a conspicuous tree 227 feet high, on the eastern point of the entrance to Mamuyon river; and 6 miles farther eastward the Abai clump 185 feet high, which from the eastward makes as an island, but is not so easily distinguished from the westward. Kinabatangan hills, 963 feet in height, situated about 10 miles inland, appear from seaward as a long range with a slight peak. Aguja peak, 638 feet high, from the eastward appears as a double cone. Confusion hill, from the north-eastward shows a round top.

Notch hill, 803 feet in height, the most conspicuous of the hills in the vicinity of the Kinabatangan river, has a sharp fall near the summit.

Mount Hatton, 1,990 feet in height, situated about 15 miles south-eastward, is the most conspicuous mount on the coast, appearing with a sharp peak from all directions. Ragged hill, 1,455 feet high, about 7 miles westward, makes from the eastward as two cone-shaped hills.

Bagahak mountain, 2,740 feet in height, in the centre of a long sloping range, is seen in clear weather beyond mount Hatton. *See view on chart.*

Kinabatangan river.—The mouth of the Kinabatangan is 30 miles eastward of Sandakan. Driftwood point, the east point of entrance, is wooded, and may be distinguished at the distance of 15 miles from the coast making as a sharp and well-defined point.

From the entrance the river trends S.W. and then S. by W. for 5 miles to Dewhurst bay, which is 3 miles long and one mile broad, having depths of from one to 2 fathoms. The main branch turns westward at 5 miles from the entrance, from whence it was examined for a distance of 6 miles ; depths of from 4 to 5 fathoms were found, and the river at this distance was 300 yards wide, with a depth of 5 fathoms. No villages were seen, and but few boats ; no fresh water was obtainable.

Bar.—The river between the entrance points is 6 cables broad, with depths of from 4 to 5 fathoms ; the bar, which extends 3 miles seaward, has a depth of 2 fathoms at high water springs. Vessels drawing more than 8 feet should not attempt to cross the bar without a boat ahead, as the tides are much influenced by the winds, rendering the time of high water uncertain.

Royalist rock, a coral shoal 4 cables long, N.N.E. and S.S.W., with a least depth of 6 feet at low water springs near its south-west end, and 18 fathoms around, lies with Driftwood point, Kinabatangan river, bearing S.S.W. distant 5 miles.

Nymphe reef, about a mile in extent, with a depth of one foot at low water springs, lies $1\frac{1}{2}$ miles N.N.E. of Royalist rock just within the 20-fathoms contour-line. Patches of $5\frac{1}{2}$ and 7 fathoms lie between it and Royalist rock. Being within the limit of discoloured water from Kinabatangan river, Nymphe reef is seldom seen, but is marked by a slight ripple. It breaks in heavy weather.

Clearing marks.—Abai clump, bearing W. by N. $\frac{1}{4}$ N., leads southward of Royalist rock and Nymphe reef, and the mouth of Kinabatangan river bearing S.W., leads eastward of them.

Pegasus reef, situated 14 miles N.E. by E. from Driftwood point, nearly 2 miles in length north and south, by $1\frac{1}{2}$ miles in width, and with

See chart, No. 1,868 [2,613].

a least depth of 3 feet, is composed of live coral with patches of sand. Depths of from 26 to 30 fathoms are found at the distance of one mile from the shoal heads; the discoloured water on the reef can be made out from the masthead.

The centre of the reef lies in lat. $5^{\circ} 46\frac{1}{4}'$ N. long. $118^{\circ} 50'$ E.

Segama river.—The mouth of the Segama river is 14 miles south-eastward of the Kinabatangan; between the entrance points it is $5\frac{1}{2}$ cables in width, with a depth of $2\frac{1}{2}$ fathoms. From the entrance the river trends S. $\frac{1}{2}$ E. for about 3 miles, with an island in it; thence it splits up into several creeks, which are narrow, with depths of from 2 to 3 fathoms.

Bar.—The shallow flat fronting the river extends about 3 miles from the coast; the least depth over which, leading to the entrance is 9 feet at high water springs. Vessels entering should send a boat ahead, as the tides are irregular.

Marowop river.—The mouth of this river, $8\frac{1}{2}$ miles south-eastward of the Segama, is 7 cables wide, with depths of from 3 to 5 fathoms between the entrance points. Near the eastern entrance point there is a conspicuous tree.

Bar.—There is a depth of 14 feet on the bar at high water spring tides, but caution is necessary in crossing, as the sea breaks on it with S.E. winds.

From the entrance, the river trends S. by E., a distance of 3 miles, to Evans island, where it divides into numerous branches.

Tangusu bay is a shallow bight south-westward of Tambisan island.

Rock.—A rock with 4 feet at low water springs, lies nearly one mile off the shore reef with Tambisan peak bearing N.E. by E. distant 2 miles.

Tambisan island, 3 miles in length, east and west, by $1\frac{1}{4}$ miles in breadth, is about 220 feet in height, and covered with trees. The west point is easily distinguished from seaward, but the east point is low the island is fronted by a coral reef to the distance of three-quarters of a mile. A narrow channel separates the island from the mainland, which is only navigable by small craft.

Tides.—It is high water, full and change, at Kinabatangan river at 11h. 17m., springs rise $5\frac{1}{2}$ feet, neaps 4 feet; at Tambisan island at 10h. 52m., springs rise $3\frac{1}{2}$ feet. Between Sandakan and Tambisan the flood stream sets to the north-westward, and the ebb to the south-eastward; the tidal stream is slight, rarely as much as one knot.

At the distance of 10 miles from the coast, during the south-west monsoon, the regular south-east current, from one to 2 knots an hour,

makes itself felt, and the north-westerly (flood) set is not experienced, only a slackening of the current during flood tide.

Between Tambisan and Dent haven the tidal streams are more strongly marked; the flood sets to the northward and the ebb to the southward at the rate of from 2 to 3 knots per hour.

OFF-LYING BANKS.—**René shoal**, composed of coral and sand, is 5 miles in length in a north-west and south-east direction, and 2 miles in breadth within the 20-fathoms contour-line. From the least depth of 3 fathoms, the peak of Tambisan island bears S.W., distant $4\frac{1}{2}$ miles.

Gem reef, situated 3 miles northward of the north-west end of René shoal, is a coral patch, 3 miles in length north-west and south-east, and nearly 2 miles in breadth, with a depth of 3 feet near its centre. From the shoal heads Tambisan peak bears S. by W., distant about $8\frac{1}{2}$ miles.

Magpie bank.—This extensive bank lies with its south-eastern end about 6 miles northward of Gem reef; within the 20-fathoms contour-line, it is 7 miles in length in a north-west and south-east direction, and $2\frac{1}{2}$ miles wide. With the exception of the western side of the bank, the depths increase suddenly to upwards of 100 fathoms. The centre of the bank, with a depth of 10 fathoms, lies N. $\frac{1}{4}$ W., distant $17\frac{1}{2}$ miles from Tambisan peak; an isolated patch of 9 fathoms, the least water found on the bank, lies $1\frac{1}{2}$ miles south-westward of this position.

Sunday bank, lying north-eastward of Magpie bank, and distant about 23 miles N. $\frac{1}{2}$ E. from Tambisan island, is somewhat circular in shape and about $4\frac{1}{2}$ miles in diameter; it has depths of from 9 to 47 fathoms upon it, and very deep water around. The shoalest part known (9 fathoms, coral bottom) lies near the north-western edge in approximately lat. $5^{\circ} 50' N.$, long. $119^{\circ} 9' E.$

Normandy bank, about 5 miles in length N.N.E. and S.S.W., and $2\frac{1}{2}$ miles in width, has depths of 6 to 50 fathoms, coral, and very deep water around. The shoalest part lies near the south-west end. The depths between this bank and Sunday bank, 2 miles westward, are upwards of 100 fathoms.

Sentry bank, the northern edge of which has not been defined, is probably about 7 miles in extent; it has depths of from 7 to 50 fathoms, and deep water around, the shoalest spot ascertained being about one mile within its south-western edge in approximately lat. $5^{\circ} 40' N.$, long. $119^{\circ} 18' E.$

Currents.—During the two days that the *Egeria* was at anchor on Sentry bank (in the month of August), the current was observed to set almost constantly between N.E. and S.E., varying from three-tenths of a knot to $1\frac{1}{2}$ knots an hour, but the tidal streams appeared to exercise a decided influence on the strength and direction of the current.

See chart, No. 1,868 [2,613].

Tidal streams.—The flood stream was observed to set to the south, and the ebb to the north.

Talamtan bank.—*See* page 143.

Coast.—From Tambisan island the coast trends E.S.E. for $3\frac{1}{2}$ miles to Tanjong Unsang, where it turns gradually to the southward for 10 miles to Dent Haven. It is densely wooded, and fronted by a narrow fringe of coral, which is steep-to.

DENT HAVEN is nearly 2 miles broad between Reef and Mangrove points, and affords good anchorage in the south-west monsoon, in about $3\frac{1}{2}$ to 4 fathoms, sand and mud; but a slight swell sometimes sets into the bay. The southern part of the bay, near the Mangrove islands, is foul. Three brackish streams run into Dent haven; the two northern are dry across their entrances at low water. In the southern stream, boats can find good shelter inside the spit, in deep water, the entrance being through a narrow channel in the reef. The whole coast line is but the barrier of a great swamp, filled with trees, mostly dead or blasted.

Banks.—Reef point, the northern point of the haven, is foul for two-thirds of a cable from the shore; and a sand-bank awash at low water lies N.E. $\frac{3}{4}$ E., distant 3 cables from the point. To the northward of Reef point, within the 5-fathoms line, which extends to a distance of about half a mile from the shore, the soundings are very irregular.

A bank, on which Hull rock stands, lies eastward of Reef point, and stretches as a narrow tongue of hard sand, with $3\frac{1}{2}$ to 5 fathoms on it, for nearly $1\frac{1}{2}$ miles north of Hull rock and one mile south of it. Hull rock is covered by 4 feet at low water and breaks with south-west winds; from the rock Reef point bears W.S.W., distant $1\frac{1}{2}$ miles.

Between the shore bank and the northern tongue of Hull rock bank there is a channel half a mile wide with 6 to 7 fathoms, but it is obstructed by a sandy patch about one cable in diameter and covered by 3 to $3\frac{1}{2}$ fathoms water; this channel is not recommended.

A small patch of $4\frac{1}{2}$ fathoms, with depths of 7 to 9 fathoms around, lies 6 cables W. by S. $\frac{1}{2}$ S. from Hull rock.

Hardy patch, a narrow coral shoal $1\frac{1}{2}$ cables in extent, with a least depth of 3 fathoms on it and 7 to 8 fathoms around, lies in the approach to Dent haven; from it Mangrove point bears W. by S. $\frac{1}{2}$ S., distant $2\frac{1}{4}$ miles; and Hog point N.W. by N. The shoal is marked by strong tide rips over it and the water about it is usually discoloured.

This shoal constitutes a danger to ships passing Dent haven at night or in thick weather, but it may be avoided by keeping outside the 20-fathoms contour-line, which passes one mile eastward of it.

Anchorage.—Between Reef point and Mangrove point the general depth is from $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms over a sand and mud bottom, the deeper water

and less irregularity of bottom being found in the northern part of the bay. There are two patches of $2\frac{3}{4}$ and 3 fathoms N. by E. of Mangrove point, situated respectively 4 cables and 8 cables from that point.

Directions.—Coming from the northward, to avoid Hull rock and bank, the extreme point southward of Dent haven should not be brought to the southward of S.W. by S. until the southern end of the long sandy beach in the bay bears W. by S. $\frac{1}{2}$ S., when it may be steered for, anchoring as convenient.

Supplies.—There is no village in Dent haven, but natives occasionally visit the place. Fish may be obtained with the seine near the beach southward of the southern stream. Bathing is dangerous on account of alligators.

Tides.—It is high water, full and change, at Dent haven at 6h. 34m. ; springs rise $3\frac{1}{2}$ feet.

Tidal streams.—Between Dent haven and Tanjong Labian the streams run strongly, from $1\frac{1}{2}$ to 3 knots at times, flood to the south and ebb to the north, but the tidal streams are extremely variable in strength hereabouts, and there is no certainty as to their direction. Occasionally the stream was observed to run strongly in one direction for one or two days, and then in the opposite direction for a day, for no reason that could be assigned ; at other times the streams changed approximately at high and low water by the shore.

Further westward on the north shore of Darvel bay the tidal streams are weaker, and run about one knot per hour at springs, flood to the westward and ebb to the eastward.

In Dent haven the tidal stream begins to set to the northward 3 hours before high water, and to the southward 3 hours before low water ; it appears probable that this is an eddy.

COAST.—From Dent haven the coast curves very gradually for 7 miles to the southward and south-westward, forming, however, a definite point at Tanjong Labian. In the vicinity of Dent haven the coast is swampy and fringed by mangroves, but as it curves to the southward and westward the swamp gives way to a hard sand beach closely backed by jungle, through which, however, it is not difficult to force one's way, and there are along this coast occasional comparatively open spaces where deer may frequently be found.

Several small streams find their way to the coast, but there are no rivers.

Tide rips.—From Gem reef to Sibutu passage frequent and sharply-defined tide rips occur, which have the appearance of shoal water.

SIBUTU PASSAGE separates the Borneo islands from the Sulu archipelago. It is a safe and deep channel, 17 miles wide between Sibutu and Simonor islands, the shore on either side being steep-to.

Tides.—When navigating this passage, great attention must be paid to the tides, which run with a velocity of 2 to 4 knots. The times of high water at Sibutu island, Dent haven, port Bongao, Pearl bank, Dok kan, and Kagayan Sulu are from 6h. to 6h. 50m., and the streams run for 3 hours after high and low water, but it must be borne in mind that the times of high water at Tambisan, and on the Borneo coast to the northward, are from 10h. 52m. to 12h., and that the streams are weaker than in the offing.

The officers of *H.M.S. Nassau* remarked during the survey in 1872 that the tidal streams in the main channel were very steady in direction; the flood stream setting N.W. and ebb to South, but there was uncertainty as to duration, the streams occasionally running as much as ten hours at a time, probably influenced by the winds and also by changes in the moon's declination, as with the tides on the south coast of Mindanao. See page 28.

In the channel west of Sibutu island the officers of *H.M.S. Egeria* in 1892 observed the flood stream to set to the south, and the ebb to the north, with a velocity of from 3 to 4 knots an hour, and the streams to turn with high and low water by the shore.

SIBUTU ISLANDS AND REEFS lie directly on the route between Dent haven and Sibuko bay; the channel between their northern limits and the southern shore of Tanjong Labian, 16 miles in width, forms the main approach to Darvel bay from the northward and eastward.

Navigation amongst these reefs is rendered easy by the help of the islets, which are readily distinguished, and are conveniently situated for fixing a ship's position.

The channel on the western side of Meridian and Frances reefs, and eastward of Blake reef, Payne rock, and James patch, is convenient as affording anchorage in every part; the only narrow part of it is when passing Maranas islet, which may be passed on either side, and no special directions are necessary.

The channel, westward of the line joining Blake reef and Payne rock and eastward of Riddells reef, is $2\frac{1}{2}$ miles wide at its narrowest part between Blake reef and Siluag islet; it is perhaps the most convenient to use generally, being more direct than those further to the eastward, whilst the tidal streams do not attain the same strength as in the channels to the westward.

The channel, west of Siluag islet and Riddells reef, and east of Bajapa reef, is 7 miles long with a minimum breadth of $1\frac{1}{2}$ miles. The tidal

See charts, Nos. 928 [2,614] and 2,576 [2,605].

streams run here with great strength and they should be well considered before using this route.

The channel between Bajapa reef and Alice reef is about 6 miles long, and $1\frac{1}{2}$ miles wide between the steep edges of the reefs on either side. The tidal streams run straight through the channel with considerable strength.

Along the southern edge of the bank on which these reefs stand, a rim of lesser depths runs close within and parallel to the 100-fathoms contour-line, but no depths less than 17 to 20 fathoms have been found on this rim; the edge falls steeply to great depths and is clearly marked by tide rips and overfalls, which give the appearance at times of shoal water.

SIBUTU ISLAND, the north end of which is in lat. $4^{\circ} 55' N.$, long. $119^{\circ} 28' E.$, runs nearly north and south, and is 16 miles in length with a breadth of $2\frac{1}{2}$ miles in the middle, narrowing slightly towards the extremities. The eastern coast is slightly convex, and the western coast concave. With the exception of Sibutu peak, a conical hill 500 feet high on the east coast, the island is flat, and densely wooded with trees whose tops are elevated about 100 feet above the sea.

The coastline is mostly a low cliff of upraised coral, broken here and there by a sandy beach. A narrow reef fringes the coast on both sides and to the northward, but from the south point the reef extends southward for $4\frac{1}{2}$ miles with a breadth of $2\frac{1}{2}$ miles, enclosing a shallow lagoon 6 miles in length, lying close to the south-east coast, but with no apparent entrance.

The reef dries in patches at low water, and near the southern end there is a sand-bank with a wooded islet on it, the trees upon which reach a height of 120 feet; there are also two other small islets on the sandbank.

The fringing reef is steep-to around, and there is no anchorage. On the western shore at $4\frac{1}{2}$ miles from the northern point there is a village with a small wooden pier.

Omapui, Sipankot, and Tumindao are a chain of low flat-topped wooded islets, on a reef 27 miles in length and 8 miles wide, lying 2 to 3 miles west of Sibutu island and parallel to it. Tumindao, the largest of these islands, is $7\frac{1}{2}$ miles long, north and south, with a breadth of $1\frac{1}{2}$ miles, and like the other islands is wooded and of uniform height, the tops of the trees being from 130 to 190 feet high. A chain of small wooded islets and rocks stretches for 3 miles south of Tumindao.

Though it is stated that there are no permanent inhabitants on any of these islands, they are much frequented by fishermen from Simonor and Borneo for trepang, which is found in great profusion on the reefs to the westward. The natives report that wild cattle are very numerous in Sibutu, and that Omapui abounds with wild pigs.

From the north-east point of Omapui, the northernmost of these islets, the reef trends north-westward for 2 miles, and then south-westward for a

distance of 4 miles to the entrance of a large lagoon which extends 8 miles to the southward and affords access to the western shore of Tumindao, where there is a village. This lagoon has not been examined in detail, but it appears to be fairly clear of coral patches and to have a general depth of 7 to 10 fathoms. The entrance is considerably narrowed by obstructions, but in case of necessity a vessel could doubtless enter the lagoon with a favourable light, and a boat ahead.

From the lagoon entrance the western edge of the reef trends southward for 23 miles, with no break in its continuity except two narrow channels into a lagoon near the south end of the reef; this southern lagoon has depths of 7 to 12 fathoms, and a narrow shallow opening to the eastward.

The edge of the reef is everywhere very steep except off the north-west point near the lagoon entrance, where the 10-fathoms line is distant nearly three-quarters of a mile.

The channel between Sibutu to the eastward and Omapui, Sipankot, and Tumindao is from $1\frac{1}{2}$ to 2 miles wide, but the tidal streams run from 2 to 4 knots at springs, flood to the southward and ebb to the northward.

Andulinang islet, lying $11\frac{1}{2}$ miles S.W. $\frac{1}{2}$ W. from the north-west point of Omapui, is small and wooded, with a conspicuous tree on its summit 110 feet high, and a rock about 30 feet high close to and immediately to the north of it.

The islet is situated close to the western edge and nearly 3 miles from the south end of a pear-shaped reef 6 miles in length north and south and $1\frac{1}{2}$ miles wide for the southern half, tapering to half a mile in width at the northern end. The reef dries in patches at low water, and has on it near the northern end two sand cays drying 3 feet.

Purdie patches are a series of small detached sand and coral shoals with 7 to 9 fathoms water over them, lying off the north end of the above reef and 3 to 6 miles N. by E. from Andulinang islet.

Chambers knoll, situated $3\frac{6}{10}$ miles N.W. $\frac{1}{4}$ W. from Andulinang islet, is a small detached coral knoll with 9 fathoms water on it.

Maranas islet, lying $2\frac{3}{4}$ miles S. by W. from Andulinang islet, is small and wooded, the tops of the trees being 85 feet above the sea. It stands on a reef that projects about half a mile from the islet; the edges of the reef are steep, and there is a clear channel half a mile wide between it and Andulinang islet reef.

Meridian reef, separated from the southern end of Andulinang reef by a channel half a mile wide and 7 fathoms deep, stretches southward for 12 miles with an average width of one mile. A sand cay that dries 4 feet at low water lies near its southern end.

The western side of this reef runs off shoal for upwards of half a mile from the edge for the greater part of its length, and then drops down into 10 fathoms.

Middle reef, lying half a mile southward of Meridian reef, is $2\frac{1}{2}$ miles in length, north and south; a sand cay lies near its northern extremity. The channel between Meridian and Middle reefs has a depth of 13 fathoms in the centre, but is too much narrowed by the shoal water running off the reefs on either side to admit of a ship using it with safety, as the tides run through it with great strength.

Anchorage.—A ledge of 8 to 12 fathoms extends three-quarters of a mile from the eastern side of Middle reef, falling steeply into deep water; the tides run strongly here, but it nevertheless affords an anchorage and is the nearest that can be obtained to the southern end of Sibutu island.

Frances reef, immediately to the southward of Middle reef, is the southernmost of the chain of reefs extending from Andulinang islet; it is $4\frac{1}{2}$ miles in length, N.E. by N. and S.W. by S.

The eastern side of Frances reef is quite steep; the western side, on which there is a long sand cay dry at low water, shoals gradually. The channel between Middle and Frances reefs has 6 to 7 fathoms in it, but the edges of the reefs are ill-defined, moreover it is narrow and has not been closely examined.

Blake reef, westward of Maranas islet, is $2\frac{1}{2}$ miles in length, north and south, by one mile in width; the channel between Blake and Maranas reefs is two-thirds of a mile wide.

Bulu Bulu islet, situated $3\frac{1}{2}$ miles S.S.W. $\frac{1}{4}$ W. from Maranas islet, is small and wooded, showing a well-defined summit over the centre, 105 feet high to the top of the trees. The islet is surrounded by a reef to a distance of about two cables; a small coral patch of 7 fathoms lies three-quarters of a mile N.W. $\frac{1}{4}$ W. from it.

Payne rock, awash at low water, is nearly in the centre of a narrow shoal of sand and coral, three-quarters of a mile in length north and south, with depths of 3 to 5 fathoms over it, and lies $6\frac{1}{4}$ miles South from Bulu Bulu islet.

James patch is a small coral patch with 7 fathoms on it and deep water around, lying $3\frac{1}{2}$ miles southward of Payne rock.

Siluag islet, one-third of a mile in length, lying $6\frac{1}{2}$ miles S.W. by W. $\frac{1}{4}$ W. from Andulinang islet, is wooded and flat topped, the tops of the trees being 85 feet high. A sand cay that dries 3 feet stands on the narrow fringing reef close to and immediately north of the islet.

Riddells reef, the north end of which lies $4\frac{1}{2}$ miles South of Siluag islet, is a narrow coral reef $2\frac{1}{4}$ miles in length north and south, with two sand cays that dry at low water near its southern end.

Nearly midway and exactly in the line between Siluag islet and Riddells reef there are two coral shoals; the northern of these has 5 fathoms on it at 2 miles south of Siluag islet, the other, a mile further south, or $1\frac{1}{2}$ miles from Riddells reef, has a depth of $3\frac{1}{2}$ fathoms.

Bajapa reef, the north-eastern end of which lies 2 miles W.N.W. from Siluag islet, is $8\frac{3}{4}$ miles in length in a N.N.E. and S.S.W. direction, and $1\frac{1}{2}$ miles wide in the middle; it dries in patches at low water and encloses a lagoon in the centre, the entrance to which is on the south-west side. This reef is steep-to except at the north end, where shoal water extends for a short distance.

Panguan islet is a small wooded islet, 75 feet high, standing on the southern side of a narrow steep reef which projects one-third of a mile to the northward of the islet. It lies $6\frac{3}{4}$ miles W. $\frac{1}{4}$ S. from Siluag islet.

Alice reef, to the north-eastward of Bajapa reef, is $5\frac{1}{2}$ miles in length N.N.E. and S.S.W., with a width of about $1\frac{1}{2}$ miles in the middle; it is steep-to around, except off the north-east point, from which the 5-fathoms line lies at a distance of over half a mile.

Alice channel is the deep channel between Panguan islet and Bajapa reef to the north-east, and Matakings islets and reef to the south-west; it is 6 miles in width at the narrowest part between the south point of Bajapa reef and Matakings islet.

The islands to the westward of Alice channel will be described after Darvel bay.

Tides.—It is high water in Alice channel, at full and change, at 6h. 20m. The tidal streams run strongly, especially in the vicinity of Panguan islet and Bajapa reef, flood to the southward and westward, and ebb to the northward and eastward, with a velocity of 2 to $2\frac{1}{2}$ knots.

In the channel west of Sibutu island, and also in the channel east of Meridian reef, the streams run from 2 to 4 knots. The streams change approximately at high and low water by the shore.

On the edge of the bank south-west of Frances reef there are strong tide rips and overfalls; the flood stream runs here with exceptional strength, frequently as much as 3 knots, and sets to the southward and south-eastward over the edge of the bank.

DARVEL BAY, on the south side of Unsang peninsula, penetrates about 60 miles to the westward from Tanjong Labian. The north shore of the bay is clear of outlying reefs, but the west and south shores contain numerous islands and coral reefs; a detailed description of these will follow. Numerous rivers discharge into the bay, but very few are navigable for boats beyond a short distance from their mouths.

The hills on the north side (densely wooded) are for the most part low and undulating, of uniform outline, presenting few definite features, and

See charts, Nos. 2,376 [2,605] and 1,680 [2,609].

culminate in the Bagahak range midway along the coast. The south coast is also everywhere thickly wooded, with mountainous ranges standing some little distance back from the coast, but these are generally more remarkable in shape and more easily recognisable than those on the north shore. Most conspicuous among them may be mentioned mounts Madai and Sinalong, and on a clear day mount Silam at the head of the bay overtops all others in the vicinity.

Of the islands in the bay, Timbu Mata island, separated from the mainland by only a narrow channel, is much the largest, and its sharp summit is an excellent landmark. Gaia pulo, just within the entrance to the bay, stands well out from the land and is of so remarkable a shape from most points of view that it is quite unmistakable.

On the coasts of the bay there are but few inhabitants. A few villages are seen on the north shore, but none on the mainland on the south side. The only islands that are inhabited are Larapan, Tatagan, Bum Bum, Onadal, and Danawan. These natives are descendants of the pirates that formerly infested these waters; they cultivate very little land, and subsist principally on fish. The languages spoken among them are Malay and Sulu. The Company appoints a native chief and pays him a regular salary; through him dealings with the natives are carried on. The chief at present resides on Tatagan island.

The British North Borneo Company have settlements at Silam and Lahat Datu on the north coast, and at Simporna in the Tando Bulong channel on the south side. The Government Resident resides at Silam, and a detachment of constabulary is stationed there.

Winds and weather.—The following remarks are by the officers of H.M.S. *Egeria* during the survey in 1891 and 1892:—

March was a very dry month with light winds, principally from north-west to north-east, and a considerable proportion of calms.

April in 1891 was also a very dry month, but in 1892 it was exceptionally wet, rain falling nearly every day, and several thunderstorms were experienced. The winds in both years were light, principally from north-west, with an increasing proportion from between north-east and south-east, the easterly winds usually setting in during the forenoon or afternoon, but always quite light. The temperature of the sea was distinctly higher this month than at any other time in 1891.

In May the winds blew very fairly from all quarters, but with a preponderance from between the north and north-west and also from between north-east and south; westerly winds beginning to be noticeable. The thermometer stood higher than in March and April, but with a cloudy sky the heat was not so oppressive. In 1891 more rain was experienced in May than in the previous month.

See chart, No. 1,680 [2,609].

In June, easterly, southerly, and south-westerly winds prevailed, but were light; there was a decided increase in the amount of rain.

In July south-westerly and north-westerly winds increased markedly both in frequency and force, with an occasional squall from the north, force 5, accompanied by heavy rain lasting for about an hour. Rainfall about the same as last month.

In August the winds were light, principally from north-west, but with a considerable proportion from south and south-east; an afternoon squall of wind and rain from the south or south-west, force 3 to 5, was a frequent occurrence. Rainfall diminishing; temperature also showing a slight decrease.

The barometer during the whole period from March to August varied but little, never rising above 30·06 or falling below 29·84.

Tidal streams.—The general set of the flood stream is to the southward and westward, and of the ebb to the northward and eastward, these directions being modified by the trend of the land and reefs in particular localities.

Along the northern shore of Darvel bay the flood stream sets westward and the ebb eastward, about one knot per hour at springs. Along the southern shore of the bay the flood stream runs to the westward, and the ebb eastward and north-eastward, the direction being modified by the land; the strength is not very great.

The tidal streams appear to turn approximately at the times of high and low water by the shore.

COAST.—Tanjong Labian, the north-east point of Darvel bay, is low and difficult to locate precisely from seaward. From this point the sandy beach trends S.W. by W. for 4 miles to a rounded point conspicuous by the high casuarina trees immediately behind it; from thence it takes a direction W. by S. $\frac{3}{4}$ S. for $7\frac{1}{2}$ miles to another rounded point also remarkable for its high trees, and close to the westward of which is the entrance to the small river Sibet, the mouth of which dries across at low water and is marked by nipa palms.

Between this last point and Tunku point, $11\frac{1}{2}$ miles further westward, the coast forms a slight indentation, at the head of which is the village of Tolibas and another scattered village; Tolibas village is at the mouth of a small stream, the entrance to which for boats is marked by stakes.

Aspect.—Between Tanjong Labian and Tunku point the land rises gradually from the low sandy coast to a wooded ridge 400 to 500 feet in height at a distance of about $1\frac{1}{2}$ miles from the coast. There is nothing remarkable in this ridge, and an uniformly flat densely wooded country forms the eastern portion of Tanjong Unsang peninsula. At 3 miles behind Dent haven there appears to be a range of wooded hills 400 to

See charts, Nos. 1,868 [2,613] and 1,680 [2,609].

500 feet in height which show on the sky line, but the only hill that can be identified is a wooded summit 500 feet high, $3\frac{1}{4}$ miles south-westward of Dent haven.

Mount Bagahak, 2,740 feet in height, situated 7 miles W.N.W. from Tunku point, is the summit of the mountainous range on the north shore of Darvel bay. It falls steeply to the northward and eastward, and is prominent as a distinct peak from those directions, but is frequently obscured by clouds. Mount Bagahak slopes very gradually to the southward and westward, and thence shows as a smooth-topped range with no prominent features on it.

Falling to the northward to quite a low watershed, the ridge-rises again to a rounded apex 1740 feet in height, at $5\frac{1}{2}$ miles N.N.E. from mount Bagahak, and continuing for 6 miles north-eastward it then gradually diminishes in altitude, terminating in End hill, 1,400 feet high, from which it slopes gradually down, and loses itself finally in the flat wooded country behind Tanjong Labian.

Tunku point is low and rounded, and lies N. by E. $\frac{1}{2}$ E., distant 24 miles from the summit of Gaia pulo. Westward of the point the land rises to the Bagahak range, the spurs from which run down in steep slopes to the coast. Northward of Tunku point there is a well-defined ridge of undulating hills from 400 to 575 feet high, standing from one to 2 miles back from the coast. Tunku river, which has its rise 12 miles northward of Tunku point, flows through a gap in these hills and enters the bay close to the westward of the point. The entrance has only one to 2 feet water on the bar at low water. A village stands on the bank of the river about three-quarters of a mile within the entrance.

Caution.—A mud flat that dries projects nearly half a mile from Tunku point, and shoal water extends a quarter of a mile further, dropping very suddenly down into 14 fathoms. The edge of the shoal does not always show clearly on account of the general discolouration of the water by the Tunku river; as the marks for fixing the position are distant, Tunku point should not be rounded closely, and vessels should keep outside the 20-fathoms contour-line when passing it.

The 10-fathoms line lies at a distance of $1\frac{3}{4}$ miles from the coast off the Casuarina point south-west of Tanjong Labian, from whence it gradually approaches the coast to half that distance off the villages. From the regularity of the soundings the indications of the lead serve as a reliable guide in navigating this coast, at night or in thick weather, but care should be taken not to shoal the water under 10 fathoms westward of Tanjong Labian, nor under 20 fathoms to the north-eastward of it.

Bagahak point (about 12 miles westward of Tunku point) is itself a low mangrove point, but a spur of the Bagahak range, 520 feet high,

See chart, No. 1,680 [2,609].

runs down in a southerly direction to within a short distance of it. This spur is a prominent feature when seen from eastward or westward, and a summit on it, 950 feet high, about one mile inland, forms a landmark easily identified from those directions, but not from the southward, as it is backed by the higher land.

For a distance of 3 miles on both sides of Bagahak point the coast is fringed by coral reefs about three-quarters of a mile in width, in which there are three narrow channels leading to the shore with depths of from 5 to 10 fathoms. The edges of these reefs are steep-to.

Howard shoal, lying 2 miles south of Bagahak point, is the only outlying danger off the north-eastern coast of Darvel bay. It is a narrow coral shoal, with a least depth of 14 feet, 3 cables in length in an E.S.E. and opposite direction within the 5-fathoms limit, rising abruptly from depths of over 20 fathoms.

Turner patch is a small coral shoal with 9 fathoms (and possibly less) on it, standing on the edge of the 20-fathoms contour-line at the distance of $1\frac{1}{4}$ miles from the coast, and $4\frac{1}{10}$ miles E. $\frac{3}{4}$ N. from Shoal point.

Kennedy bay has not been minutely examined, but it appears to afford good anchorage in 10 fathoms, mud, at the distance of two-thirds of a mile from its head. A horn of reef projects nearly half a mile southward from the north-eastern point of the bay, and a shallow broad flat extends $1\frac{1}{4}$ miles south-eastward from its western side.

Kennedy bay may be entered by bringing the summit of the south-westernmost coast hill, 335 feet high, to bear N.W. $\frac{3}{4}$ W., which bearing will also lead half a mile south-westward of Turner patch; anchorage in a depth of 10 fathoms may be had when Shoal point bears S.W. $\frac{3}{4}$ W., with the western extreme of Tabauwan island just open to the southward of it.

DARVEL PENINSULA, the southern face of which is 3 miles long, east and west, is low and flat, fronted by mud flats, and covered by trees, their tops presenting an uniform outline about 110 feet high. Deep mangrove creeks intersect the peninsula; none of these, however, were found actually to connect with the Silibukan river.

Shoal point is the south-eastern extremity of Darvel peninsula; shallow water extends $2\frac{1}{4}$ miles eastward from the point, forming the shallow flat in Kennedy bay, and also southward of the peninsula to a distance of nearly one mile. The depth decreases very suddenly from 10 to 3 fathoms south-eastward of the point, and vessels passing should keep a good offing as the lead gives but little warning. Tanjong Malandong is the south-west point of the Darvel peninsula.

Armstrong reef, a small coral reef, drying 5 feet at low water, with depths of 6 to 7 fathoms around it, lies $2\frac{1}{4}$ miles W. by N. $\frac{1}{4}$ N. from Tanjong Malandong.

Clearing mark.—The summit of Adal island in line with the south-western peak of mount Sidongal bearing S.S.E. $\frac{1}{2}$ E., leads 6 cables westward of Armstrong reef and half a mile westward of the edge of the shoal spit off the entrance to Segannen river.

Segannen and Silibukan rivers converge at $1\frac{1}{4}$ miles within their common entrance on the north-west side of Darvel peninsula. This entrance is nearly half a mile wide at the mouth, and may be recognised by a clump of trees 130 feet high on the northern point, somewhat higher than the dead level of the trees in the immediate neighbourhood.

A shoal spit extends $1\frac{1}{2}$ miles westward from the entrance to these rivers. The deepest water over the bar is 4 feet at low water springs, with the northern summit of mount Silam in line with the summit of Sakar island, bearing West. On passing the fishing stakes and steering for the northern entrance point the water deepens to 8 and 10 feet at one cable southward of that point. Mud flats stretch off the southern entrance point, which should therefore be avoided.

The northern and western edges of the above-mentioned spit are very steep, falling down abruptly from 3 feet to 11 fathoms; the lead therefore on passing it is but little guide, and strict attention should therefore be paid to the clearing mark.

Segannen, the northern river, was explored by the boats of the *Egeria* as far as the Segannen tobacco estate, about 3 miles up the river, where there is a jetty for landing and a road leading from it to the estate.

Silibukan, the southern river, was also examined as far as the tobacco estate lately opened at Telok Bukan, 4 miles from the junction of the rivers. At the estate the river is about 20 yards in width, with a depth of 6 feet, but the level varies with the seasons. A small steam vessel from Sandakan visits these estates fortnightly.

Coast.—From the entrance of the above rivers the coast curves round in a northerly and westerly direction for 8 miles to the settlement of Lahat Datu. Detached reefs and foul ground extend off the greater portion of this coast, to a distance of nearly a mile from the shore. From Lahat Datu a mangrove coast trends to the southward for 3 miles to the boat passage between Sakar island and the mainland.

LAHAT DATU, situated in the north-western portion of the bay, formed by the coast north of Sakar island, is a small settlement forming the head-quarters of the Darvel bay tobacco company. This estate occupies the flat country at the back of the settlement, and a road leads

See chart, No. 1,680 [2,609].

northward from it to the Segama river estate about 10 miles distant, but in wet weather the road is almost impassable.

The zinc-roofed houses at Lahat Datu are visible on approaching from the direction of Darvel peninsula as soon as they open out clear of Sakar island. A wooden pier with native houses on it projects to a short distance from the shore.

A pier 440 yards in length and 70 yards in breadth at the end, extends in a south-east direction from the south-west corner of the settlement into a depth of 3 fathoms. The steamers that call at intervals go alongside.

Voorwyk reefs are a chain of four small reefs extending from half a mile to $1\frac{1}{2}$ miles in a S.E. $\frac{3}{4}$ E. direction from the pier at Lahat Datu. They dry 2 feet at low water and are fairly steep-to, with a depth of 7 fathoms close to, but shoal water extends for a short distance to the southward of the south-easternmost reef.

The western edges are marked by beacons, consisting of tripods surmounted by a drum.

A circular coral patch, about 30 yards in diameter, with 4 feet over it and a depth of 6 fathoms close around, lies midway between the north-west Voorwyk reef and the shore to the northward of it. Two tripod beacons mark the north and south ends of it respectively.

Gray reef is a small coral reef half a mile south of the pier, with a depth of 3 to $3\frac{1}{2}$ fathoms close to its eastern edge. Another small reef lies one-third of a mile to the southward of it.

Both of these reefs are marked by beacons on their eastern edges.

Anchorage.—The anchorage at Lahat Datu is between Gray reef and the northernmost Voorwyk reef, in a depth of 5 fathoms mud, with the conspicuous tree near the manager's house bearing N. 13° W., and a remarkable conical hill 580 feet high on the western shore of the bay bearing W. by S. $\frac{1}{2}$ S.

Sakar island is only separated from the mainland to the westward by a narrow channel, and is not recognisable as an island. It is 5 miles long, E.N.E. and W.S.W., with an extreme breadth of 2 miles, densely wooded, and rises near the centre in a conspicuous knob to a height of 735 feet, visible over Darvel peninsula. The southern shore is straight, but the north coast is deeply indented, narrowing the island in two places to a width of half a mile, and there are some small islets close to the shore on that side.

The north-eastern extreme of Sakar island runs down to a low mangrove point from which a reef projects eastward for nearly three-quarters of a mile. Three wooden beacons are placed on the edge of the reef to mark it, but they are liable to be washed away. The edge is not always easily distinguished, and it should be rounded with caution.

Clearing mark.—The summit of Adal island in line with the south-western peak of mount Sidongal bearing S.S.E. $\frac{1}{2}$ E., just clears the edge of the reef off the north-eastern extreme of Sakar island, and Adal island must be brought to the westward of this peak before rounding the reef. Both Adal island and the south-west peak of mount Sidongal show as sharp well defined summits.

Halloran reef, lying 4 cables off the centre of the north coast of Sakar island, and $1\frac{1}{2}$ miles W.N.W. from the north-east point of that island, is a small coral reef drying 5 feet at low water; shoal water extends for a short distance off its north-east edge, which is marked by a tripod beacon.

Clearing mark.—The western extreme of Darvel peninsula, just touching the eastern extreme of Sakar island, leads a quarter of a mile north-east of Halloran reef.

Boat channel.—The channel westward of Sakar island is only one cable wide in places, with a depth of 2 to 4 feet at low water. Steam launches can use this channel at high water, but a rock nearly awash at low tide lies on the eastern side, three-quarters of a mile within the southern entrance, and about half a cable westward of the south-west point of an islet at a turning point in the channel.

Islets south of Sakar.—**Crook reef** lies off the middle of the south coast of Sakar island, one mile to the southward of the conspicuous knob. Some small islets lie close off the south-west end of Sakar; the southernmost of these islets has a sharp nipple 125 feet high at its south-east end.

Topography.—Westward of the Bagahak range there is a considerable area of apparently flat country drained by the Silibukan river. At $8\frac{1}{2}$ miles northward of Darvel peninsula a ridge running north and south rises to a summit 995 feet high which is readily distinguished. Westward of this ridge and separated from it by a valley, the land gradually rises from the coast to a perfectly flat-topped densely wooded ridge about 600 feet in height, and lying 3 miles from the coast; the top of this ridge forms the sky line as viewed from the sea.

Directions for Lahat Datu.—From a position not less than $1\frac{1}{2}$ miles southward of Darvel peninsula, a vessel should steer to the westward until the summit of Adal island comes in line with the south-west peak of mount Sidongal bearing S.S.E. $\frac{1}{2}$ E., then keep that mark on astern until mount Silam is in line with the summit of Sakar island, when haul to the northward and bring the eastern extreme of Adal island in line with the south-west peak of mount Sidongal, in order to clear the reef projecting from Sakar island.

See chart, No. 1,680 [2,609].

Having passed that reef, haul north-westward, and when the remarkable conical hill on the west side of the bay bears West, steer for it until the south-west extreme of Darvel peninsula touches the east end of Sakar island; then steer W.N.W. until the conspicuous tree in front of the manager's house bears N. 13° W., and the tree steered for on that bearing will lead up to the anchorage between Voorwyk and Gray reefs, in a depth of 5 to 6 fathoms, mud.

SILAM HARBOUR in the north-west part of Darvel bay, is 7 miles across between Sakar island and Tanjong Batu.

A line of detached reefs extends from Sakar island in a S.W. by W. direction, terminating in Adams reef, 4 miles from the islet 125 feet high off the south-west point of Sakar; this line of reefs obstructs the eastern approach to Silam. Kalung Kalungan pulo (145 feet high), standing on one of these reefs about the middle of the chain, indicates the main entrance, which is immediately north of this islet.

Pulo Babi, 410 feet in height, stands near the centre of the harbour; midway between Babi and Tanjong Batu the Saddle islands extending in a S.E. by E. direction, nearly landlock the anchorage off the settlement.

The anchorage off Silam may be approached by passing either north or south of the Saddle islands. The approach from the eastward passing north of the islands, is quite clear after passing Kalung Kalungan, but Power spit, projecting from the north point of Pulo Tabauwan, must be avoided. The passage from the southward is 4 cables wide between Sagai pulo, the westernmost Saddle island, and Bayan tanjong, the point immediately south of Silam, and is quite clear except for the fringing reef which extends about 1½ cables from the mainland shore.

In the north and north-west parts of the harbour there are several reefs, and foul ground extends to 3½ cables from the shore.

North coast of Silam harbour. — From Sakar island the coast trends to the westward for 6 miles to Silam anchorage, with a few minor indentations.

Soai Soaiun bay, 2 miles E.N.E. from Silam, is 2½ cables wide at the entrance, and curving round to the westward branches into two arms at the head, which is shoal. In the outer part of the bay there is a depth of 7 to 8 fathoms, but barely room for a vessel to swing.

The shore, on the north-eastern side at the entrance, may be approached within a cable's length, but from the islet forming the south-western entrance point, foul ground and reefs extend for 3 cables in the direction of the Woodhall reefs.

Woodhall reefs are two detached coral reefs, which lie half a mile from the northern shore of Silam harbour, and about three-quarters of a mile East of Soai Soaiun bay; they are together about half a mile in length

W.N.W. and E.S.E., and $1\frac{1}{2}$ cables in width, and dry one foot at low water.

A narrow detached reef, 2 cables long, lies 2 cables north of the north-east point of Pulo Babi, and narrows the channel between it and the Woodhall reefs to a width of 3 cables.

Mark hill in line with Wise hill bearing N. 72° W. leads fairly through the middle of the channel.

Mark hill rises to a well-defined summit 1,530 feet high, at $1\frac{1}{2}$ miles N.W. by N. from Silam anchorage, to which it sends down a long spur. It is readily recognisable, being the first summit showing on the sky line north-east of mount Silam.

Mount Silam is a flat-topped wooded mountain 2,920 feet in height, $2\frac{1}{2}$ miles westward of Silam. It is altogether the highest mountain within many miles, and stands up boldly, being separated by a deep valley from the other mountains to the westward and southward of it, and falling steeply to the north-east; the ridge rising again to Mark hill continues to the eastward as a coast range with a gradually diminishing altitude.

Mount Beeston, situated 9 miles W. $\frac{1}{4}$ S. from mount Silam, is a wooded peak 2,830 feet in height, sending a long spur in a S.E. by E. direction for $9\frac{1}{2}$ miles down to the coast on the north side of Lamak bay. About half way along this spur there are the Stewart peaks, nearly three-quarters of a mile apart, the western being 1,610 feet, and the eastern 1,510 feet in height. From these peaks two ridges are thrown off; one trending for a long distance to the W.S.W. and the other curving round to the southward forms an amphitheatre in which the Divatu river takes its rise.

Babi island, near the middle of Silam harbour, is half a mile long W.N.W. and E.S.E., thickly wooded, with a remarkable conical summit 410 feet high near its eastern end, and is easily recognisable on approaching the harbour. There is very little reef off its southern and south-eastern sides, but from its western point a tongue of reefs projects for $3\frac{1}{2}$ cables in a north-westerly direction. Some rocks near the end of this reef just show their heads at high water.

Misan Misan reef, lying 9 cables S. 66° E. from Babi island, is the south-westernmost of a line of reefs extending from Sakar island; it is small, barely covered at low water, and occasionally difficult to distinguish. The passage between Misan Misan reef and Kalung Kalungan is 8 cables in width.

Mark hill kept open to the south of Babi island bearing N. 63° W. clears Misan Misan reef to the south. Also, Mark hill in line with the north-east extreme of Babi island bearing N. 66° W. clears Misan Misan reef to the north, and leads between it and the reefs to the north-east.

See plan, No. 1,593 [2,610].

Kalung Kalungan islet, small, with a round top 145 feet high, lies $1\frac{1}{4}$ miles S.S.E. from Babi island. It stands on a reef which projects about three-quarters of a cable from the islet.

Gusong di laut is a narrow reef 3 cables long, east and west, and awash at low water, lying 4 cables W. $\frac{1}{2}$ S. from Kalung Kalungan, with a clear passage between them.

Kissing hill in line with the east extreme of Babi island bearing N. 6° W. leads between Gusong di laut and Kalung Kalungan reefs.

Wanderer reef, awash at low water, lying $8\frac{1}{2}$ cables S.W. by W. from Kalung Kalungan, is 4 cables in length N.N.E. and S.S.W. and $1\frac{1}{2}$ cables wide.

Adams reef is a small reef lying $5\frac{1}{2}$ cables W.S.W. from the south end of Wanderer reef, and $8\frac{1}{2}$ cables S. $\frac{3}{4}$ E. from the easternmost Saddle islet. There is a small sand bank at its eastern extreme which dries 2 feet at low water, at which time the remaining part of the reef is just awash.

Mark hill in line with the western extreme of Sumabun pulo bearing N. 32° W. clears Adams reef to the south-west.

The Saddle islands are a chain of six wooded islands extending from half a mile to $2\frac{3}{4}$ miles in a S.E. by E. direction from Bayan point, immediately south of Silam.

Sagai pulo, the westernmost, stands on a reef separated by a very narrow passage from the reef projecting from Sumabun pulo, the next island; it is 195 feet high.

Sumabun pulo, 6 cables in length north-west and south-east, and 2 cables wide, is 280 feet in height; it is connected with Nipa Nipa, the next island to the south-east, by a reef.

Tabauwan pulo is 6 cables long north and south, with a summit near its central part 305 feet in height, and a hill on its northern end 175 feet high.

Giffard islet, the easternmost of the chain, is connected with Tabauwan pulo by a reef, on which stands another small islet; it is wedge-shaped, rising at the eastern end to a height of 120 feet. A reef extends one cable eastward from this islet.

Power spit, a coral ledge extending in a N.W. by N. direction for $3\frac{1}{2}$ cables from the north extreme of Tabauwan pulo, slightly obstructs the main channel between the Saddle islands and Babi pulo.

Batu tanjong, the southern point of Silam harbour, is the eastern extremity of a low range of coast hills.

Close to the eastward of Batu tanjong are the two Saranga islets, very nearly joined together. These islets are fringed by reef which projects

southward 2 cables from the south end. The passage between these isles and Batu tanjong is barred by a reef.

A small detached reef lies 4 cables eastward of the Saranga islands.

SILAM.—The North Borneo Company have a small settlement here, and one of their officers is always resident, with a detachment of constabulary. There is a small village on the beach, and a wooden pier 200 yards long projects from the village over the shore reef; steam launches can lie off the end of the pier.

The channel leading to the pier is marked by wooden beacons on the edges of the reefs, the beacons on the north side carry small red flags, and those on the south side white flags, but the beacons are liable to be washed away. The channel can only be used by boats or steam launches; larger vessels must anchor outside.

An experimental garden has been planted about half a mile from the beach, in which Liberian coffee seems to grow well; also cardamoms and pepper. Timber is plentiful and good; cattle thrive well.

Position.—The Residency flag-staff, about 200 yards from the beach, is in lat. $4^{\circ} 57' 40''$ N., long. $118^{\circ} 12' 40''$ E. The observation spot is marked by a stone, with the position cut on it.

Supplies.—There are a few Chinese traders here. Fish, eggs, poultry, and a small quantity of bananas and yams can generally be obtained.

Tides.—It is high water, full and change, at Silam anchorage, at 6h. Om.; springs rise $7\frac{1}{4}$ feet, neaps 4 feet. There is very little tidal stream, which appears to turn approximately at the times of high and low water by the shore.

Anchorage.—The anchorage off Silam is on a very uneven bottom of sand and coral, and is encumbered by three small coral heads with 4 fathoms over them in the southern part of the anchorage, and a fourth coral head, Holmes rock, with 3 fathoms on it, lying $7\frac{1}{4}$ cables N.E. from the western extremity of Sagai pulo, and $7\frac{1}{2}$ cables S. 52° E. from the end of the pier. A large ship should anchor outside these patches in a depth of 15 to 16 fathoms, but a moderate sized vessel can anchor on the banks within them.

A good berth for a small ship is with the north extreme of Babi island, touching the south point of the southern islet off Sakar island S. 86° E., which is a convenient mark to keep on astern when nearing the anchorage; anchor in a depth of 10 fathoms, sand and coral, when the east extreme of the southern Saranga islet touches the west extreme of Sagai pulo bearing S. by W. $\frac{1}{2}$ W. This berth only just gives room to swing, and vessels cannot approach nearer to the pier.

The edge of the reef off Silam is very irregular and broken up into patches.

South-west of Silam and to the north of Batu tanjong the coast forms a bight which affords sheltered anchorage in a depth of 10 fathoms, mud, with Batu tanjong bearing S.S.E. $\frac{3}{4}$ E., distant $4\frac{1}{2}$ cables.

Directions for Silam anchorage.—After passing Darvel peninsula at a distance of not less than 2 miles, steer for Kalung Kalungan pulo; pass north of this island at the distance of about one third of a mile and steer N.W. by W. $\frac{1}{8}$ W. for Mark hill until the south extreme of the southernmost islet (125 feet) south-west of Sakar comes in line with the north extreme of Babi island bearing S. 89° E. Then approach Silam inner anchorage with this mark on astern, which will lead a full cable northward of Holmes rock, and also northward of the 4-fathoms patches previously mentioned.

From the southward.—From a position with the east extreme of Giffard islet touching the west extreme of Babi island (which line clears Mooren reef to the eastward and Adams reef to the westward), and with Mark hill seen over the west extreme of Sagai pulo bearing N.N.W., steer for the latter, being careful not to open Mark hill westward of the islet; this course leads a quarter of a mile north-eastward of the small reef lying eastward of the Saranga isles. When Babi island begins to show between Nipa Nipa and Sumabun islands the course can be altered to round Sagai pulo at the distance of from one to 2 cables, after which bringing the west extreme of Sagai pulo in line with the summit of the southern Saranga isle to bear S.S.W., steer with this mark on astern up to the anchorage, passing between the two westernmost of the 4-fathoms patches, and anchoring as convenient, as above.

COAST.—From Batu tanjong the coast trends S.W. $\frac{1}{2}$ S. for $3\frac{1}{2}$ miles to Hastings point, fronted by several small detached reefs extending to a distance of from $1\frac{3}{4}$ to $2\frac{1}{2}$ miles from the shore, within which distance it is not prudent to navigate. This distance corresponds approximately with the 20-fathoms contour-line of soundings. Hastings point may be identified by a conspicuous little wooded knoll 260 feet high near its extremity. Some small detached reefs lie half a mile eastward of the point.

Lamak bay, between Hastings and Skertchley points, penetrates $1\frac{3}{4}$ miles to the westward and affords anchorage in from 5 to 8 fathoms, mud. The south and west sides of the bay are shoal, the 2-fathoms line being distant upwards of a mile from the shore, but the north-west corner is deeper. The rivers Divatu, Magul, Sibahong and Ladong discharge their waters into this bay, the coastline of which is fronted by extensive mud flats. None of these rivers are sufficiently broad or deep to allow

See plan, No. 1,593 [2,610], and chart, No. 1,680 [2,609].

boats to ascend them for any considerable distance, and they cannot be entered at all except at high water.

Skertchley point is a low mangrove point lying $2\frac{1}{2}$ miles S. $\frac{3}{4}$ E. from Hastings point. A spit of sand and mud, which dries, extends in a north-easterly direction for three-quarters of a mile from the point, and must not be approached too closely, as it falls somewhat steeply, and the lead will give but little warning. The entrance to the Ting-kiau river is immediately to the southward of the point; it is too shallow to admit boats.

Kiddle reefs, lying $1\frac{1}{2}$ miles S.S.E. from Batu tanjong, are two small reefs with some foul ground just to the north of them. Mark hill open eastward of Saranga isles N. by W. $\frac{1}{4}$ W. leads eastward of them.

Moorhen reefs are four small reefs, the southernmost of which lies $2\frac{1}{2}$ miles E.S.E. from Hastings point.

West Stewart peak seen over the summit of Hastings point bearing N. 60° W. leads one-third of a mile to the south of Moorhen reefs; and the summit of Babi island well open to the east of the eastern end of Giffard islet N. 36° E., leads just eastward of them.

Coast.—Between Skertchley point and the mouth of the Sungei Madai, 7 miles to the S.S.E., the mangrove coast projects slightly in a rounded point, and there are two salt water creeks in this stretch. A ridge of coast hills 300 to 400 feet in height, running N.N.W. from the north entrance point of Sungei Madai for 2 miles assists to identify the river mouth.

Mountains.—Mount Skertchley is a broad flat-topped mountain 1,530 feet high, situated 8 miles S. by W. from Stewart peak and standing 6 miles back from the coast.

Mount Madai, lying $5\frac{1}{2}$ miles S.E. $\frac{1}{4}$ E. from mount Skertchley, and $4\frac{1}{2}$ miles from the coast, is 1,560 feet high, and quite the most remarkable mountain in Darvel bay. It is of limestone with bare cliffs which show white in places, but on the summit there are some low trees and the slopes are densely wooded. From the eastward the mountain shows as a perfect cone, from the northward it appears as a sharp peak standing on shoulders of nearly equal height.

Mount Fiton, near the eastern end of the mount Madai ridge, is 690 feet high, and not remarkable from the sea, as it is backed by higher land; the interest in this hill is on account of the Bird's-nest caves situated immediately below it. These caves are reached by ascending the Sungei Madai as far as practicable, and then a path of about 3 miles leads to the caves.

Sungei Madai is important as leading to the Bird's-nest caves. A small mangrove islet lies three-quarters of a mile eastward of the entrance, from which a broad tongue of reef projects nearly a mile to the northward; the passage into the river lies between this projection and the shore reef. At the mouth of the river there is a depth of from 3 to 4 feet, at low water, deepening to 2 and $2\frac{1}{2}$ fathoms within. The Sungei is navigable by boats for a distance of $1\frac{1}{2}$ miles.

Tagabua is a small wooded islet 67 feet high, lying $\frac{3}{4}$ miles N.N.E. $\frac{1}{2}$ E. from Sungei Madai, and 6 miles S.E. $\frac{1}{4}$ E. from Skertchley point. It is bordered by foul ground and detached reefs on its west and south sides; to the southward this foul ground extends to a distance of nearly one mile, which must be avoided by vessels visiting Sungei Madai. Anchorage may be had in 9 fathoms, mud, at $1\frac{1}{2}$ miles S.W. from the islet.

Coast.—From Sungei Madai the coast trends S.E. $\frac{1}{2}$ E. for 7 miles to the entrance of Sigalong trusan. The coastline, which is everywhere of mangroves, is irregular; the shore reef is much broken up with various off-lying patches.

Mounts Mostyn, Wyatt, Cook, and Hewett are conspicuous and well determined marks for ascertaining a ship's position in this locality; they are respectively 1,625, 410, 705, and 1,355 feet in height. Mount Mostyn can be seen from Sibuko bay.

Merrett reefs are a line of reefs running north for $2\frac{1}{2}$ miles from the western entrance point of Sigalong trusan. A rocky patch with less than 6 feet water on it lies a quarter of a mile eastward of these reefs, with the west extremity of Timbu Mata island bearing S.S.E. $\frac{1}{2}$ E., distant $1\frac{1}{2}$ miles.

Another patch with 3 fathoms on it, about one mile eastward of Merrett reefs, lies with the west extremity of Timbu Mata bearing S. by E. $\frac{1}{4}$ E., distant one mile.

Sigalong trusan, separating Timbu Mata island from the mainland varies in width from three-quarters of a mile to 3 miles, and is only navigable for launches and small vessels, being barred near the middle by a mud flat with but 9 feet water over it; the channel, also, is narrow and tortuous.

Vessels, having occasion to enter Sigalong trusan from the westward proceed between the two rocky patches above mentioned, steering to pass a little over a cable's length from the edge of the reef skirting the eastern entrance point, and avoiding a patch with $2\frac{1}{2}$ fathoms on it immediately within the entrance point; the depth in this part of the Trusan is from 5 to 6 fathoms. The channel passes to the southward of a wooded island 260 feet high one mile within the entrance, and south of a rock which

dries 5 feet at low water, situated 3 cables S.S.W. $\frac{3}{4}$ W. from a second and much smaller islet half a mile within the first. The south shore must not be approached within one third of a mile after passing this rock.

The deepest water will be found by skirting the north shore at a distance of about 3 cables, and on closing the point abreast of Sipit river, a straight course S.E. by E. $\frac{1}{2}$ E. for $2\frac{1}{2}$ miles to the point on the north shore where the Trusan narrows, will lead over the flats in a depth of about 9 feet.

After passing these narrows the water deepens somewhat, but shoals again before approaching a high bluntly conical islet which is passed on its south side at a distance of $1\frac{1}{2}$ cables, it then deepens steadily and the remainder of the channel is quite clear and deep between the edges of the reefs.

Sipit river falls into the south side of Sigalong trusan just to the westward of Pyramid hill. The entrance is fronted by a broad flat over which, for a distance of 2 miles, the depth is only about 2 feet at low water, deepening within to 3 and 4 fathoms; but although there are several arms in which there is deep water, they are all so narrow at 2 to 3 miles from the entrance that nothing but a canoe can get further than that distance.

Pyramid hill is a remarkable pyramidal-shaped hill, 1,050 feet in height, standing close to the coast about half way along the southern shore of Sigalong trusan. It is the northernmost peak of an isolated range of hills occupying the peninsula eastward of Sipit river.

Mount Sinalong, situated about $7\frac{1}{2}$ miles S. $\frac{1}{2}$ E. from Pyramid hill, is one of the most conspicuous mountains on the south side of Sigalong trusan. It is 2,960 feet high, conical in shape, and falling steeply to the plain below on all sides is readily recognisable.

Sigalong river, falling into the south-eastern part of Sigalong trusan $3\frac{1}{2}$ miles south-westward of Langas island, flows nearly north and drains the country east of mount Sinalong. It is broad and deep within the entrance, carrying 4 fathoms for some distance, but on the bar at the mouth the depth is only 3 or 4 feet at low water. The banks are lined with nipa palms, and the steam cutter of the *Egeria* ascended the river for 5 or 6 miles, finding it free from snags and other obstructions.

ISLANDS AND REEFS IN DARVEL BAY.—

Little reef is a small reef awash at low water situated 2 miles N. by W. $\frac{1}{2}$ W. from the west end of Maganting island.

Nichols reef is a small coral patch nearly awash at low water lying $2\frac{1}{2}$ miles W.S.W. from the west end of Maganting island.

See chart, No. 1,686 [2,699].

Lawler reef lies 8 cables N.E. by E. $\frac{1}{4}$ E. from Tagabua islet.

Maganting island is the westernmost of a group of thickly wooded islands occupying the southern part of Darvel bay, and lies S. by E. $7\frac{1}{4}$ miles from pulo Babi in Silam harbour. It is over a mile in length, E.S.E. and W.N.W., narrow, and 385 feet high, with a hill at either end and a slight depression between. There is a small reef off the middle part of the southern side of Maganting island, distant about one-third of a mile from the shore.

Bohihan island, lying one mile eastward of Maganting, is triangular in shape, its sides being each about one mile in length; the summit, elevated 780 feet, is very rounded. A long thin reef obstructs the passage between Bohihan and Tanna pulo, situated three-quarters of a mile south-westward. Palundangan islet, 330 feet high, lies south of Bohihan and close to it.

Majinkil and **Bakuhang islets**, south of Palundangan, are both small; the former has a well defined summit, 430 feet high. A small islet stands near the edge of a reef lying 3 cables west of Majinkil.

Normanhurst reef, two-thirds of a mile S.W. $\frac{3}{4}$ S. of Bakuhang islet, is a narrow reef, 3 cables long north-east and south-west; it may be passed on either side close to. The west extremes of Maganting and Tanna islands in line leads westward of this reef.

Sheppard, Rashleigh, McKinlay, and Walton reefs are all small coral patches nearly dry at low water, and about $1\frac{1}{2}$ miles apart, forming along with Lawler reef a line which corresponds approximately with the 20-fathoms contour-line. The easternmost of these reefs, Walton, lies nearly 3 miles N.N.E. from the west end of Timbu Mata island, with the south-eastern extremes of Tabauwan and Sihmpat islands nearly in line.

Tabauwan, situated 4 miles eastward of Maganting island, is the largest and easternmost of this group of islands. Being higher than the remainder of the group and standing well out from the land, it is easily recognisable when approaching from the eastward. It lies $8\frac{1}{2}$ miles south-westward of Darvel peninsula, is $3\frac{3}{4}$ miles in length in an E.S.E. direction, and rises about the middle to two peaks; the western peak, 905 feet in height, shows sharply from all directions. There is but little reef surrounding the island, except near the south-eastern end, where a tongue of reef stretches for over 2 cables to the southward.

Near the middle, on the southern side of Tabauwan, a bay, a quarter of a mile in width and three-quarters of a mile deep, is formed between two promontories jutting out to the S.S.W. from the slopes of the two peaks; this bay has depths of 13 to 18 fathoms in the centre, but at the head it is foul for nearly a quarter of a mile from the shore.

Silumpat island, lying 2 cables south of Tabauwan, is $1\frac{1}{2}$ miles in length N.N.W. and S.S.E. and 550 feet in height. It is nearly divided into two islands, the parts being only connected by a low narrow neck of land near the north end.

Dawson rock, covered by 6 feet at low water, is a small pinnacle rock at the western end of a narrow bank about three-quarters of a mile in length east and west, with a depth of 17 fathoms rising from surrounding depths of 26 to 30 fathoms. The pinnacle lies $1\frac{8}{10}$ miles S. 61° E. from Bakuhang islet.

Pudsey reefs are two small reefs awash at low water, $1\frac{1}{2}$ miles apart; the northern reef lies $2\frac{1}{2}$ miles S. 87° E. from Bakuhang islet, the southern lies $3\frac{1}{4}$ miles S. 61° E. from the same islet.

Learmonth reef, nearly awash at low water, lies 2 miles S.E. $\frac{1}{2}$ E. from the southern extremity of Silumpat island and midway between that island and Pulo Bati Laut. It is about a quarter of a mile in extent, and usually shows clearly.

Bakuhang island, Bankauhang islet, and Gatahang islet, stand on reefs which are nearly joined, lying E. by S. $\frac{1}{2}$ S. from Tabauwan island. The passage between this group of islets and Tabauwan is $3\frac{1}{2}$ miles in width. Gatahang, the westernmost and smallest of the group, is 68 feet high with a solitary tree on the summit; a reef projects 4 cables westward of the islet. Bakuhang, the easternmost and largest, is 235 feet in height, and lies $1\frac{1}{2}$ miles W. by N. from Adal island with a passage between them.

Adal island is a conspicuous small conical wooded island 360 feet in height, situated $2\frac{3}{4}$ miles N.E. by E. from the north-east point of Pulo Bati Laut. It is fringed by a narrow reef, and a sand spit covered at high water projects westward from its south point.

TIMBU MATA ISLAND, in the southern part of Darvel bay, is 16 miles long, east and west, with an extreme width of $5\frac{1}{2}$ miles, and is separated from the mainland by Sigalong trusan. The island is densely wooded and mountainous, rising from a low western point to mount Tanga Ballu, near its centre, a sharp conical summit elevated 2,035 feet; this mount, from its height and shape, makes a conspicuous landmark. On the eastern extremity mount Sidongal, a conical mountain 1,605 feet high, is also very conspicuous.

The western end of Timbu Mata, with the south coast of Pulo Bati, forms a bay, at the head of which there is anchorage in a depth of 13 fathoms; on the south side of the bay there are some small off-lying reefs and shoals.

Hambly reef, nearly in the middle of the entrance to the above bay, is 4 cables long north and south, and awash at low water. The northern end, on which there is a rock that dries 5 feet, lies one mile S.W. $\frac{1}{2}$ W. from the south-west point of Pulo Bati. Immediately south of Hambly reef, there is a small islet 210 feet high, one-third of a mile from the Timbu Mata shore, and between it and Hambly reef there is a ledge of foul ground.

Pulo Bati, close off the north-west coast of Timbu Mata island, is 805 feet high, $2\frac{1}{2}$ miles long east and west, densely wooded, with two deep indentations on the south side. Its shores are lined with mangrove. A reef projects $2\frac{1}{2}$ cables to the west of the island. Shal water extends across the channel between Pulo Bati and Timbu Mata.

Pulo Bati Laut, $1\frac{1}{2}$ miles in length east and west, and 795 feet in height, is separated from the north point of Timbu Mata by a channel 2 cables wide with a depth of $3\frac{1}{2}$ fathoms in the middle.

From Pulo Bati Laut to Tanjong Sidongal, the east point of Timbu Mata, the coast is deeply indented by bays, but these are greatly encumbered by reef, and the approaches to them are very foul. Vessels should not approach the coast within the 20-fathoms contour-line.

Balusuan islet, lying $1\frac{1}{2}$ miles from the north coast of Timbu Mata, and situated 4 miles S.S.E. from Adal, is small and 60 feet in height. South of this islet and close to the Timbu Mata shore there is a larger islet 250 feet high. Patches of foul ground and reef extend to a distance of half a mile north and east of Balusuan, and thence in a south-easterly direction for $4\frac{1}{2}$ miles towards Tanjong Sidongal; this foul ground projects upwards of a mile from the Timbu Mata coast. Vessels should not attempt to pass to the southward of Balusuan.

Tanjong Sidongal (Bluff point).—The shore reef projects one-third of a mile eastward of Tanjong Sidongal, and thence curves round in a convex form south-westward to Tanjong Timbu Mata; on this reef there are two low islets.

Shoal.—A coral shoal with $3\frac{1}{2}$ to 5 fathoms on it lies nearly half a mile from the edge of the reef between points Sidongal and Timbu Mata, with the extreme of the latter point bearing W.S.W., distant $2\frac{1}{2}$ miles. Vessels should pass south of this shoal; the distance from it to the north end of the reef projecting from Langas island is three-quarters of a mile.

The south extreme of the islet, 70 feet high, off Tanjong Timbu Mata, in line with the south extreme of a larger island $2\frac{1}{2}$ miles to the westward, bearing S. 70° W., leads clear of this shoal, and fair in the middle of the entrance to Sigalong trusan.

Tanjong Timbu Mata (Grassy point), the south point of Timbu Mata island, is formed by a spur from the mountains projecting to the

south. Near the water's edge it is fringed with trees, and there are a few trees on the upper part of the ridge. Shoal water extends for a quarter of a mile southward of the point.

Westward of Tanjong Timbu Mata the coast forms a bay, but it is too much encumbered by reef to admit of its being entered very far. A vessel could, however, doubtless anchor out of the tide in a depth of 6 or 7 fathoms, with the south extreme of the point bearing E. by N. $\frac{1}{4}$ N., distant half a mile, by passing between the shoal water off the point and the reef fringing the small islet three-quarters of a mile south-westward; but this anchorage has not been examined closely. The *Egeria* in 1892 anchored in a depth of 12 fathoms, with the point bearing W. $\frac{1}{2}$ S. distant three-quarters of a mile.

Water can be obtained from a small spring near the southern extreme of Tanjong Timbu Mata, close to the sea, this appears to be a favourite watering place with the natives.

Langas island, south of Tanjong Timbu Mata, is about $4\frac{1}{2}$ miles in length north-east and south-west, and is flat-topped and wooded, with a single conspicuous hill 360 feet high at its south-western end. A reef extends from half to three-quarters of a mile from the northern end, leaving a channel three-quarters of a mile wide between it and Tanjong Timbu Mata. The channel between Langas and the mainland is half a mile in width, and between Langas and another island to the westward of it one mile wide. Shoal water extends about two-thirds of a mile off this last island; to keep in the deepest water the S.W. point of Langas should be rounded at the distance of about 2 cables.

Larapan island lies three-quarter of a mile east of Langas island, the tops of the trees on it are nearly of an uniform height of about 200 feet. The channel between Langas and Larapan is one-third of a mile in width, the edges of the reef on both sides of it are irregular and broken up.

GAIA PULO and BOHI DULONG, two high islands standing on the same reef, and almost united, are quite the most striking landmarks seen on approaching Darvel bay; together they form a crescent 4 miles across. These islands, as well as Timbu Mata, can be seen from the northern part of Sibuko bay over the low islands southward of them. They are uninhabited and densely wooded.

Bohi dulong, forming the eastern horn of the crescent, has a prominent peak 1,200 feet high near its southern extremity; the south-western part of Gaia pulo, forming the western horn of the crescent, rises to a peak 1,510 feet in height, with two slightly lower peaks close to it, presenting remarkable outlines, especially when viewed from the north and east. The eastern part of Gaia pulo culminates in a conspicuous peak 1,210 feet

See chart, No. 1,680 [2,609].

high; the land between the eastern and western part being low, causes Gaia pulo to appear as two islands from some views.

Position.—The summit of Gaia pulo is in lat. $4^{\circ} 37' N.$, long. $118^{\circ} 44\frac{1}{2}' E.$

Tatagan island, close off the south-western point of Gaia pulo, is small, 320 feet high, and partly cleared at the top. On the northern end there is a village, the present residence of the native Chief through whom the British North Borneo Company carry out their dealings with the natives.

Reef.—The reef round Gaia pulo extends on the north-west side to a distance of $1\frac{1}{4}$ miles from the island, and there assumes the form of a barrier reef, approaching the shore closely on the north-east side. On the south side of Gaia pulo the barrier reef trends in a south-easterly direction for $2\frac{3}{4}$ miles from Tatagan island, and thence in a north-easterly direction for the southern point of Bohi dulong. The lagoon south of Gaia pulo has depths of 10 to 16 fathoms in it, and is fairly clear of patches for a considerable space in the centre.

Anchorage.—In the lagoon south of Gaia pulo there is anchorage out of the tide in a depth of 10 to 11 fathoms, sandy bottom, east of the village. The passage into the lagoon, one-third of a mile south of Tatagan island, is less than a cable in width, with depths of $3\frac{1}{2}$ to 4 fathoms, but there are no marks for it, and if a small vessel desired for any purpose to enter the lagoon it would be necessary to place boats on the edge of the shoal water as a guide for entering. The north extremes of Sabankat and Salakan islands in line bearing $S. 64^{\circ} W.$ just touches the north side of the passage.

Anchorage may be had outside the lagoon in a depth of 10 fathoms, half a mile S.W. by S. of Tatagan, but the tides run here with some strength.

Water.—The natives of Tatagan obtain their water from a spring close to the beach near the south-west point of Gaia pulo.

Sabankat and Salakan islets lie on an extensive reef midway between Gaia and Larapan islands. Sabankat, with the tops of its trees 160 feet above the sea, stands on the south-west extremity of the reef, which extends 5 miles N.N.W., and $3\frac{1}{2}$ miles E. $\frac{1}{2}$ N. from the islet; two rocks about 5 feet high stand on the reef, $1\frac{1}{4}$ miles to the north of Sabankat. Salakan, 240 feet in height, lies $1\frac{3}{4}$ miles N.E. by E. $\frac{1}{2}$ E. from Sabankat. The passage between the eastern part of this reef and the Gaia reef is three-quarters of a mile wide.

Maiga islet, 125 feet high, situated $1\frac{1}{2}$ miles N. by W. $\frac{1}{2}$ W. from Salakan islet, stands on the south-western edge of a detached reef $1\frac{1}{2}$ miles in length N.N.W. and S.S.E. and half a mile in width; there is a channel one mile wide between it and Gaia reef.

Sibuan islet is a small wooded islet on the southern end of a reef nearly a mile long N.N.E. and S.S.W., separated by a deep channel three-quarters of a mile wide from the northern edge of the extensive reef on which Sabankat and Salakan stand.

Church reef, awash at low water, is $1\frac{1}{2}$ miles in length N.N.E. and S.S.W. and one mile in width, and lies north-westward of Sibuan island reef, from which it is separated by a deep channel three-quarters of a mile wide.

Richards reef consists of a collection of reefs the outer edges of which are awash at low water; it encloses an area 2 miles in length north-east and south-west, and nearly the same in width. On the north-west and north-east sides the edges of the reefs are not steep-to, and the 10-fathoms line projects nearly half a mile in the latter direction, but elsewhere the reef rises abruptly from depths of 40 fathoms and upwards.

From the south-west extremity of Richards reef the summit of Gaia pulo bears S. by E., distant 6 miles.

Freemantle shoal, lying one mile E.N.E. of Richards reef, is about one mile in diameter, with depths of 8 to 10 fathoms over coral.

Mantabuan islet, with its tree tops 100 feet above the sea, stands on the southern end of a detached reef, lying $1\frac{1}{4}$ miles north-east of Gaia pulo; the reef extends $1\frac{1}{2}$ miles N.N.W. $\frac{1}{2}$ W. from the islet and a quarter of a mile S.S.E. $\frac{1}{2}$ E. of it, and is one mile in width.

Another detached reef lies one mile further eastward, with deep water around except off its southern extremity, where shoal water extends southward half a mile from the reef. A long sand bank on the middle of this reef dries 3 feet at low water.

A coral shoal with $4\frac{1}{2}$ fathoms over it lies one mile S.E. $\frac{3}{4}$ S. of Mantabuan islet; between this patch and the reef surrounding Gaia and Bohi dulong islands there is a channel nearly three-quarters of a mile wide.

Pom pom pulo, lying $4\frac{1}{4}$ miles eastward of Bohi dulong, is a small circular islet with a fairly good summit near the centre 180 feet high to the tops of the trees. The islet is surrounded by a narrow fringing reef, steep-to.

Puan pulo is a flat-topped wooded island, 130 feet high, one mile in length N.W. by W. and S.E. by E., situated $3\frac{3}{4}$ miles S. by W. from Pom pom pulo and near the northern end of a reef which extends nearly $2\frac{1}{2}$ miles in a S.S.E. direction from the island. The reef is steep-to on all sides, except at its southern extremity, from which the 10-fathoms line projects for upwards of half a mile.

Baturua reef, to the westward of Puan pulo, is separated from that island and reef by a deep channel half a mile wide. The reef is of irregular shape, 3 miles long north and south and $1\frac{1}{2}$ miles wide near the middle, and dries in patches at low water. The northern extremity lies 3 miles S.E. $\frac{1}{2}$ S. from Bobi dulong island, and from this point a bank of irregular soundings stretches northward for a distance of nearly three-quarters of a mile. Off the southern end there is also shoal water, with a patch of 3 fathoms lying half a mile E.S.E. from the end of the reef.

The tides run very strongly round this reef, and care is necessary in rounding it to avoid being set too near the edge. The channel between this reef and Bulipatuid shoal to the westward is $1\frac{1}{2}$ miles wide.

Boheian island, situated 10 miles N. by E. $\frac{3}{4}$ E. from Si Amil island, stands near the southern end of a reef which extends N. by W. and S. by E. through a length of 7 miles, with an extreme width near the middle of $1\frac{3}{4}$ miles, tapering to half a mile at the extremities. The reef itself is quite steep-to, falling down on all sides to depths of 40 and 50 fathoms within a cable's length. The islet, $6\frac{1}{2}$ cables in length north-west and south-east, is narrow, flat-topped, and wooded, and 120 feet in height to the tops of the trees.

Near the north end of the long reef there is a small wooded islet, Timba Timba, 33 feet high, with a sand bank that dries 3 feet off its southern end.

Kapale pulo stands on a reef lying half a mile northward of the reef off Timba Timba and connected with it by shoal water. The islet is small, wooded, and 90 feet high; a sand bank, at the extremity of which there are a few bushes, runs off its north end.

Pulo Matakang and **Matakang Kechil** stand on the western side of a reef lying $1\frac{1}{2}$ miles eastward of Kapale pulo, and separated from it by a deep channel; the reef is $2\frac{1}{4}$ miles long N. by W. and S. by E., and steep to on all sides. Pulo Matakang is three-quarters of a mile long, narrow, wooded, and 130 feet in height. Matakang Kechil, 45 feet high, half a mile northward is much smaller; the islets are connected by a narrow ridge of sand, drying 3 feet at low water.

Alice channel and the islands to the eastward have already been described. See page 181.

Webb shoal, lying nearly midway between the southern end of Puan pulo reef and Si Amil island, is about one mile in extent, with irregular depths of from 7 to 13 fathoms generally, and a patch of 5 fathoms near its southern end. This patch, which lies $5\frac{1}{4}$ miles north of Si Amil island, is the least depth found, but the shoal was not examined with sufficient minuteness to justify ships crossing it.

Pasalat reef, between Gaia and Bum Bum islands, is separated from the edge of the reef fringing Bum Bum island by a channel three-quarters of a mile in width. The reef is one mile in length east and west by three-quarters of a mile in width, and is awash at low water. From the north point of the reef Sabankat bears N.W. by W. distant $4\frac{3}{4}$ miles. Shoal water of one to 3 fathoms extends one mile both eastward and westward from the reef.

Bulipatuid shoal lies $2\frac{1}{2}$ miles E. by S. $\frac{1}{2}$ S. from Pasalat reef. Within 10-fathoms limits it is $1\frac{1}{2}$ miles long N.W. $\frac{1}{2}$ W. and S.E. $\frac{1}{2}$ E., and half a mile wide. In the centre of this area there is a space of about 4 cables extent with depths of 4 to 5 fathoms, but as it is possible there may be shoaler heads on it vessels should not cross this shoal.

Mount Tanna Ballu (Timbu Mata) in line with the north extreme of Sabankat island bearing N. 65° W., leads north-east of this shoal.

BUM BUM ISLAND, presenting no prominent features, is a large triangular-shaped island, flat and wooded, the tree tops being about 170 feet above the sea; the west side of the island is known as Kubong. The coastline is mostly comprised of low cliffs of upraised coral much broken up into small points and bays. On the north coast, which stretches 8 miles in an E. by S. $\frac{1}{2}$ S. direction from the north-west point, there is a good deal of mangrove, and there are several off-lying low islets on the fringing reef of sand and coral, which dries in patches. The reef extends about $1\frac{1}{2}$ miles from the shore, and south of Sabankat island it projects to the northward in a horn upwards of 2 miles from the coast narrowing the passage there to a width of $1\frac{1}{2}$ miles.

There are several villages on the north coast, and two on the south-east side about one mile from Panto Panto point, the eastern extreme of the island.

Creagh reef is an extensive flat of sand and coral almost completely dry at low water, stretching to the southward and south-westward for $7\frac{1}{2}$ miles from the south-west point of Bum Bum island. On its western edge there are three thickly wooded islets, Sipangao, Nusatonga, and Manampili, 345 to 415 feet in height, and near the centre of the reef is a wooded islet 80 feet high. The reef is barely passable for a large boat at high water.

Beaufort reef, to the eastward of Creagh reef, is $7\frac{1}{2}$ miles long N.E. $\frac{1}{2}$ N. and S.W. $\frac{1}{2}$ S., by $3\frac{1}{2}$ miles in width, and dries in patches at low water. On the north-eastern end of this reef stands Omadal islet.

Omadal islet, low and wooded, is about a mile in length E.S.E. and W.N.W. and half a mile wide. There is a village on its western end, and a break in the edge of the reef allows canoes to enter a small reef harbour.

Shoals.—Two small shoals, $1\frac{1}{2}$ miles apart with depths of 3 and $3\frac{1}{2}$ fathoms on them, lie respectively 2 miles E. $\frac{1}{2}$ N. and $1\frac{3}{4}$ miles S.E. $\frac{1}{4}$ S. from the east point of Omadal islet.

Silapag passage, between Beaufort reef on the one hand and Bum Bum island and Creagh reef on the other, is from 8 to 10 fathoms deep, with a sandy bottom. The channel trends W.S.W. for $\frac{1}{2}$ miles between Bum Bum and Omadal islands with a breadth of nearly three-quarters of a mile, then turning to the southward for 4 miles between Beaufort and Creagh reefs, it contracts to a width of one quarter of a mile.

H.M.S. *Satellite* in 1886 anchored in this channel about $1\frac{1}{2}$ cables from the village on Omadal islet, and found it an excellent anchorage, but the tide runs through with considerable strength at springs.

The flood stream sets to the southward and westward, and the ebb stream to the northward and eastward.

TRUSAN TANDO BULONG (Trusan Treacher), between Bum Bum island and Creagh reef on the east, and the mainland on the west, is about three-quarters of a mile wide, but the fringing reefs on either side narrow the navigable channel to a width of a quarter of a mile in places. Vessels proceeding to Sibuko river effect a great saving in distance by using this passage; the edges of the reef on each side are, however, very difficult to make out at times, and the tidal streams run through with considerable strength.

From the northern entrance the channel trends in a south-easterly direction for $3\frac{1}{2}$ miles, with a general depth of 17 fathoms; it then curves round gradually and takes a south-westerly direction for 8 miles to the southern entrance, the depth decreasing to 9 and 8 fathoms.

Tidal streams.—In Trusan Tando Bulong the flood stream sets to the southward and the ebb to the northward, with a strength of 3 to 4 knots an hour at springs. The streams are strongest in the northern part of the channel between Bum Bum island and the mainland.

Simporna is a small settlement on the west side of Trusan Tando Bulong, $1\frac{1}{2}$ miles within the northern entrance. A pier projects nearly a quarter of a mile over the reef into deep water; the local steamers when visiting Simporna lie alongside this pier, at the shore end of which a conspicuous zinc-roofed house affords a useful mark for making the entrance to the Trusan.

Kuli Babang.—On the west side of Trusan Tando Bulong, at 4 miles within the southern entrance, there is an inlet nearly three-quarters of a mile wide at the entrance, extending in a north-westerly direction for $1\frac{1}{4}$ miles and dividing into two arms; the southern arm is named Kuli Babang, and the northern Lok Bakong. On the eastern shore of the

northern arm is Lok Bakong hill, a remarkable conical hill 595 feet in height, forming the western end of a detached range of hills, the easternmost summit of which is Hood hill, 525 feet high, standing on the peninsula round which the Trusan turns. The entrance to this bight between the reefs is $1\frac{3}{4}$ cables wide, and 8 fathoms deep, shoaling to 3 fathoms three-quarters of a mile within the entrance points.

Tagassan bay is a small inlet on the mainland immediately within the southern entrance of Trusan Tando Bulong; the inlet is one mile wide between the entrance points, but the shore reef, which dries out from Tanjong Tutop about 3 cables, and a mud flat extending half a mile from Pakalangan point, narrows it considerably. On the northern shore of the inlet there is a little cleared grassy land where a village formerly stood, this spot is called Pakalangan; close to the beach there is a well with good water.

Tides.—It is high water in Tagassan bay at full and change at 6h. 0m. Springs rise $7\frac{1}{2}$ feet, neaps rise $4\frac{1}{2}$ feet, neaps range $1\frac{3}{4}$ feet. The tides are affected by diurnal inequality, the greatest difference between two successive high waters being 2 feet, this is attained when the moon is at her greatest declination, north or south. When the sun is north of the equator the highest high water is the a.m. tide; when the sun is south of the equator the highest high water is the p.m. tide.

Daisy islet, standing near the edge of the fringe reef on the east side of Trusan Tando Bulong, about 2 miles within the northern entrance, is noticeable on approaching the Trusan from the northward.

Directions for Trusan Tando Bulong.—Approaching from the northward:—After passing between Larapan and Sabankat islands the entrance will easily be identified by Hood hill lying right over it; there are no hills on Bum Bum island. From a position with the eastern extremity of Tinbu Mata island over the centre of Larapan island, and the north-west extremes of Gaia pulo and Sabankat in line, the opening between the reefs which extend off both sides of the entrance will be easily distinguished; the zinc-roofed house at Simporna will also be plainly seen and may be steered for, on a S. $\frac{1}{2}$ E. bearing.

This course will lead over the tail of a 5-fathoms bank running off from the eastern entrance point, which bank will be crossed when the northern points of Bum Bum island are in line bearing E. $\frac{1}{4}$ S., and then a mid-channel course may be steered to pass the end of the pier at Simporna at a distance of one cable, whence a straight course S.E. $\frac{3}{8}$ S. for the point in the channel under Hood hill will pass 2 cables west of Daisy islet. The fringe reef extends about one cable east of the above (Hood hill) point and may be rounded at a reasonable distance, the channel being 4 to 5 cables in width.

South of the point the reef projects from the west shore 3 to 4 cables, but on the Bum Bum island side the fringe reef skirts the shore at from $1\frac{1}{2}$ cables to half a cable distance. A course steered for the summit of Sipangao islet bearing S. 35° W., leads upwards of a cable from the edge of the reef off the south-west point of Bum Bum island, and continued leads the same distance from the reef on the west side, south of Hood hill.

Abreast of Sipangao islet the channel is upwards of three-quarters of a mile wide, and the ship's position can be readily fixed on the chart. The only known dangers outside the reefs on either side are two small coral patches on the east side; one patch lies N.W. of Sipangao islet and 2 cables beyond the edge of the reef; the other lies West of the south end of Nusatonga islet and $1\frac{1}{2}$ cables beyond the edge of that part of the reef.

Gusungan islet, situated 2 miles south of Tanjong Tutop, is a small sand cay with a few low shrubs on it, standing on the north-western extremity of a reef one mile long N.W. by N. and S.E. by S., and 4 cables wide, which partly dries at low water.

The channel between Gusungan islet and the south-west point of Creagh reef is about half a mile in width; vessels using it should bring the northern summit of Double hill over the west extreme of the rocky point forming the western extremity of Tanjong Tutop bearing N. 52° W., which leads fairly between the reefs, the edges of which when the sun is low or ahead is not easily distinguished.

Double hill is a saddle-shaped hill 760 feet in height, standing on a ridge between the Pöck range (which shows on the sky line) and the coast ridge, and is generally quite easy to identify from its position and shape.

Position.—The centre of Gusungan islet is in lat. $4^{\circ} 19' N.$ long. $118^{\circ} 33' E.$

SIBUKO BAY.—**Coast.**—From Tanjong Tutop, the south-western entrance point of Trusan Tando Bulong, a rocky coast backed by high hills trends westward for $2\frac{1}{2}$ miles to the entrance of a small river, and thence a mangrove coast with low ground behind it sweeps in a gentle curve to another rocky point, Delconte point, $8\frac{1}{2}$ miles W. by S. from Tanjong Tutop. Immediately above Delconte point there is a wooded range from 800 to 1,200 feet in height. Westward of Delconte point the coast recedes, forming a bay 5 miles across into which flows the river Kumpang.

Silungan is a small and wooded islet, 170 feet in height, lying $1\frac{1}{2}$ miles from the coast and 6 miles W. by S. $\frac{3}{4}$ S. from Tanjong Tutop.

Kumpang Kumpang island, lying at the mouth of Kumpang river, is $1\frac{3}{4}$ miles in length N.W. $\frac{1}{2}$ N. and S.E. $\frac{1}{2}$ S., densely wooded, and

has a summit near its centre 280 feet high. The main entrance to the Kumpong river is on the eastern side of the island; the narrow channel separating Kumpong Kumpong island from the mainland on the western side nearly dries at low water.

Saddle hill.—Westward of Kumpong Kumpong island a low mangrove shore trends to the westward for $8\frac{1}{2}$ miles to a coast ridge named Saddle hill, the eastern hump of which is 330 feet, and the western 450 feet in height.

Kumpong river.—There is not more than 3 or 4 feet water on the bar of this river at low water, but within the entrance the river has depths of 2 and 3 fathoms. On entering it appears a fine broad river with two branches, uniting at $2\frac{1}{2}$ miles from its mouth and enclosing a long narrow island.

The river was ascended by the steam cutter of the *Egeria* for 8 miles from the mouth, at which point the water was brackish. Further progress was barred by the banks narrowing, and by the interlacing of the foliage overhead, but there was still a depth of 2 fathoms water. Two branches of the river taking a southerly direction were also explored, both ending similarly in deep narrow creeks.

The mangrove ceases at 4 miles from the mouth; higher up the banks are clothed with nipa palms, with occasionally a red earthy bank appearing on one side and swamp on the other. The river is singularly free from snags or obstructions of any kind. From the topography of the country it must drain a considerable area. There were no signs of inhabitants.

Mount Pöck, 1,860 feet high, is the summit of the ranges on the eastern side of the valley of the Kumpong river, and is the westernmost peak of a mountainous range extending north-east and south-west about 6 miles northward of Delconte point, and separated from the mountains immediately behind that point by a deep valley.

Mount Wüllerstorf, rising 17 miles W. $\frac{1}{4}$ S. from mount Sinalong, is 2,500 feet in height with a conical summit, and standing 10 miles from the coast forms one of the most conspicuous mountains on the northern side of Sibuko bay. It falls steeply to the eastward to the plains below, but a range of mountains from 2,000 to 1,600 feet high stretches N.N.W. from it between which and the low spurs of the mountains to the eastward is a valley 7 miles wide through which the Kumpong river takes its course. The entire district is covered with extensive forest.

LIGITAN ISLANDS are a group of islets and reefs lying off the north coast of Sibuko bay, extending over a distance of 16 miles, east and west, from Si Amil to Mabul island, and separated from the Beauport

and Cragh reefs by the Ligitan channel. The area included within the limits of this group comprises on its eastern side an extensive reef, roughly triangular in shape, on the northern end of which stands Danawan island.

From Danawan island the reef extends in a south-south-easterly and southerly direction for 10 miles, projecting to the eastward with shallow water half a mile outside the edge of the reef on which the sea breaks heavily, and along which there are tide rips and overfalls. The water in the vicinity being considerably discoloured and the examination of the edge being somewhat of an open nature, the reef should not be approached very closely.

A patch, with a depth of $2\frac{3}{4}$ fathoms, is reported to lie half a mile to the southward of the south-east extremity of the reef in lat. $4^{\circ} 7\frac{1}{2}'$ N., long. $118^{\circ} 55\frac{3}{4}'$ E.

Si Amil island, the north-easternmost island of the group, situated $8\frac{3}{4}$ miles S.E. from Omadal island, is half a mile in diameter, 355 feet high, and thickly wooded. On its western side there is a sandy spit, and off the north-west point a reef extends for 2 cables leaving a passage 2 cables wide between the reefs of Si Amil and Danawan islands. The island is uninhabited, and uncultivated except for numerous mango trees in the valley on the west side.

Danawan island stands near the northern point of the main reef, half a mile south-westward of Si Amil; it is low, wooded and flat-topped. On the western side there is a village, and yams, sweet potatoes, mangoes, and bananas are cultivated, but the island is only accessible by boats on the eastern side where the reef closely approaches the shore.

On the eastern side of Danawan there is a bay in the reef protected by Si Amil island, but the water is deep, there being 30 fathoms midway between the two islands; anchorage, however, can be obtained in a depth of 16 fathoms at $1\frac{1}{2}$ cables from Danawan.

Ligitan islet, $1\frac{1}{2}$ miles from the south-east point of the main reef, and 9 miles S. $\frac{1}{2}$ E. from Si Amil island, is small, and but 30 feet in height; there are a few bushes on it. A sand bank that dries 3 feet lies $2\frac{3}{4}$ miles northward of the islet.

Tidal streams and rips.—Off the southern end of the reef the streams run from 2 to 3 knots, causing very heavy overfalls and tide rips; caution should therefore be exercised in approaching this end of the reef, especially as the marks for fixing the position are distant.

Foul ground.—From its southern extremity the edge of the reef turns sharply to the northward, leaving Ligitan island half a mile to the eastward, and then turns sharply again to the westward for 7 miles, thus forming a deep bight which ends at the south-west point of the reef. Foul ground and shallow water extend westward for $2\frac{1}{2}$ miles from the

south-west point, and, as it does not generally break over the edge, which falls very steeply down into deep water, the danger limit cannot always be distinguished. From the south-west point the edge of the reef trends away north-eastward to Danawan island.

Cust reef, awash at low water, is $1\frac{1}{2}$ miles in length east and west; its north point lies $5\frac{1}{2}$ miles N. 56° E. from Mabul island. Several little detached patches lie about a quarter of a mile off the northern side of this reef, which therefore should not be approached closely, nor on passing it should the water be shoaled to less than 10 or 12 fathoms.

South-east of Cust reef, and separated from it by a narrow channel, is a larger reef $2\frac{1}{2}$ miles long, east and west, and one mile in breadth, the edge of which has not been closely examined, but it appears to be foul to a distance of half a mile from the reef on all sides. The channel eastward of this reef, between it and a projecting spur of the main reef, is 2 miles wide, but although no detached patches were actually found in it, yet the survey of this portion of the group was of too general a character to justify vessels venturing in this channel or the other passages between the reefs.

Mabul island, the westernmost of the Ligitan islands, lies 15 miles W. by S. $\frac{1}{2}$ S. from Si Amil; it is small and densely wooded, the tree tops being 160 feet high, and stands near the northern end of Mabul reef, which extends three-quarters of a mile southward from the islet.

The passage between Mabul reef and Kapalai reef to the south-east is 2 miles wide, with 4 to 5 fathoms on either side, and $6\frac{1}{2}$ fathoms in a narrow channel in the middle. Nothing less than 4 fathoms has been found on either side of the channel (except close to the reefs), but the examination has not been sufficiently exhaustive to determine that there is not a less depth, and therefore it would be well to use Mabul passage on the west side of Mabul island in preference.

Kapalai islet is a small sandy islet with trees on it 40 feet high, lying $3\frac{1}{2}$ miles S.E. by E. $\frac{3}{4}$ E. from Mabul islet, and standing on the north-eastern part of a detached reef situated midway between Mabul islet and the south-west point of the main reef.

The passage between Kapalai reef and the foul ground off the south-west point of the main reef is $1\frac{1}{2}$ miles wide, but is obstructed in the middle by a patch of 5 fathoms, and it is possible that there may be other patches with less water.

Mabul passage, westward of Mabul islet, is the channel between the Ligitan group to the eastward and Ligitan reefs to the westward. It is $3\frac{1}{2}$ miles broad, but is obstructed in the middle by a bank with $3\frac{1}{2}$ fathoms on it; on the eastern side of the passage there is another bank with a depth of 4 $\frac{1}{2}$ fathoms. The deepest part of the passage lies between these two banks, and carries a depth of 7 to 8 fathoms right through.

See chart, No. 1,681 [2,611].

Mount Sidongal (on the eastern extreme of Timbu Mata island) in line with the west extreme of Sipangao island bearing N. 5° W., leads through Mabul passage and to the westward of Collins patch.

Collins patch, lying $1\frac{1}{2}$ miles N.W. by W. $\frac{1}{4}$ W. from Mabul island, is a small coral head with a depth of $2\frac{1}{4}$ fathoms, rising from a narrow bank of sand and coral extending within 10 fathoms limits for a distance of 2 miles N.W. by N. and S.E. by S. Another coral patch on the same bank with $4\frac{1}{4}$ fathoms on it lies three-quarters of a mile N.W. by W. $\frac{3}{4}$ W. from Mabul island.

Caution.—Collins bank should not be crossed by a ship unless there is some necessity for it, as the soundings on it are uneven, and it is possible that other shallow spots may exist, notwithstanding that it has been examined somewhat closely.

LIGITAN CHANNEL, between the Ligitan group on the south and Creagh and Beaufort reefs on the north, is 18 miles in length in an E. by N. and W. by S. direction, and varies in width from $1\frac{1}{2}$ miles at its western entrance, between Gusungan islet and the projecting horn of the easternmost Ligitan reef, to 6 miles abreast of Si Amil island.

The depths in the eastern part are from 11 to 14 fathoms, and further to the westward there are 18 to 20 fathoms, shoaling again to 11 and 12 fathoms at the western entrance. Except Collins patch, already mentioned, no dangers have been discovered in the channel except close to the edges of the reefs, but north, north-east, and north-west of Mabul island the ground is very uneven and rocky, and such being its character, the shoaler parts of the banks shown on the charts should be avoided if possible.

Tidal streams.—In Ligitan channel the flood stream runs to the southward and westward, and the ebb stream to the northward and eastward, with a strength of one to $1\frac{1}{2}$ knots per hour at springs.

On one occasion whilst the *Egeria* was at anchor during two days at spring tides, with high winds, in the Mabul passage the tidal streams were observed to set as follows :—

At moon's superior transit	-	-	Slack water.
At 3h. after „ „	-	-	N.N.E. max. velocity 1·2 knots
At 6h. „ „ „	-	-	E.N.E.
At 9h. „ „ „	-	-	E.S.E.
At 12h. „ „ „	-	-	S.S.E.
At 15h. „ „ „	-	-	S.S.W. max. velocity 0·9 knots.
At 18h. „ „ „	-	-	S.W.
At 21h. „ „ „	-	-	S.W.
At 24h. „ „ „	-	-	N.W. gradually changing to north.

This feature of a circular tide once in 24 hours was not observed elsewhere.

Sipadan islet, situated $7\frac{1}{2}$ miles South from Mabul island, is a small wooded islet, 165 feet high to the tops of the trees, standing on the north-west side of a reef one mile long north and south with 40 to 50 fathoms close to the reef, dropping into depths of over 300 fathoms at one-third of a mile from the islet. Turtle frequent this islet in considerable numbers.

LIGITAN REEFS are a series of detached reefs, with shoal water between them, fronting the north coast of Sibuko bay at a distance of 4 to 5 miles from the shore; from Mabul passage they extend a distance of 9 miles to the westward. On the south side of these reefs the bank on which they stand drops steeply down into deep water.

The north extreme of Silungan island in line with the summit of a mountain above Delconte point bearing N. 70° W. leads north-east of Ligitan reefs.

Near the middle of the Ligitan reefs there is a break in their continuity 2 miles wide, and through the western side of this opening there is a channel, which although not closely examined, appears from the soundings to be navigable.

Erzherzog reef, west of Ligitan reefs, and separated from them by a channel 6 cables wide, with 17 to 24 fathoms in it, is $1\frac{1}{2}$ miles in length E.N.E. and W.S.W., and has on its northern side a sand cay which dries 6 feet.

A small detached reef lies half a mile north-eastward of Erzherzog reef.

Friedrich reef is a small detached reef with a sand cay on its northern side which dries 7 feet at low water. It lies $4\frac{1}{2}$ miles South of Kumpong Kumpong island; and $1\frac{1}{2}$ miles westward of Erzherzog reef, with a clear passage between.

Chance rock, a small coral head with $1\frac{1}{2}$ fathoms over it at low water and 13 fathoms around, lies midway between Friedrich reef and Egeria shoal; from it the sand cay on Friedrich reef bears N. 72° E., distant $2\frac{3}{4}$ miles, and the west summit of Saddle hill N. 61° W., distant 8 miles.

Egeria shoal is a small patch with a depth of 2 fathoms near its centre, situated with the western peak of Saddle hill bearing N. 41° W., distant $6\frac{1}{2}$ miles, and Silungan islet bearing N. 59° E.

A small reef nearly awash at low water lies three-quarters of a mile N.N.W. $\frac{1}{4}$ W. from Egeria shoal.

Heel reef, the westernmost of the dangers in the vicinity, is a very small patch of rotten coral and mud, drying 2 feet at low water, steep-to all round and rising from a depth of 14 fathoms. From it the western

peak of Saddle hill bears N.W. by N., distant $4\frac{9}{10}$ miles, and the summit of Kumpong Kumpong island N.E. $\frac{1}{4}$ E.

Lehnert reef is a small reef of sand and coral drying 2 feet near its southern end; from it the western peak of Saddle hill bears N. 65° W., distant 5 miles.

CAUTION.—The four dangers: Chance rock, Egeria shoal, Heel reef, and Lehnert reef are all of them difficult to discern under certain conditions of light on account of the muddiness of the water about them.

Roach reefs are two reefs of small extent, a quarter of a mile apart, standing just within the 100-fathoms contour-line, about $9\frac{3}{4}$ miles S.E. from the western summit of Saddle hill; the north-easternmost and larger of these reefs dries 3 feet at low water. At $1\frac{1}{2}$ miles N.E. $\frac{1}{2}$ E. from the north-eastern reef there is a coral patch with 4 fathoms on it.

Between Roach reefs and Egeria shoals there is a clear passage 3 miles wide.

Alert patches, extending from one to $4\frac{3}{4}$ miles S.W. by W. $\frac{1}{2}$ W. from the western Roach reef are three banks with coral patches of 1 fathoms on them, and depths of 25 to 40 fathoms between the shoals.

Darby bank, lying $1\frac{1}{2}$ miles southward of the south-westernmost Alert bank and one mile within the 100-fathoms contour-line, makes the southern limit of the banks on the north side of the channel leading to Tawao. Within 10-fathoms limits it is one mile long east and west, and half a mile wide; the least depth found on it was 6 fathoms, over coral, near its centre, with mount Batu Chinaga bearing N.W. by W. $\frac{1}{2}$ W., and the western peak of Saddle hill N. by W., distant $11\frac{1}{2}$ miles.

Caution.—Although the least depth obtained on this bank was 6 fathoms, and on the Alert banks 4 fathoms; yet as a matter of prudence it is always inadvisable to cross such shoals in any vessels but those of very light draught, and it is perfectly easy to avoid crossing them by bearings of Saddle hill and Mount Batu Chinaga, which are well placed and unmistakable marks.

HAND ROCK is the most serious of all the dangers bordering the approaches to the Tawao channel from the eastward. It lies on the edge of the 20-fathoms contour-line, 3 miles west of the south-westernmost Alert patch. The rock itself is barely awash at low water, and stands on the middle of a small coral bank with 5 to 10 fathoms over it and 15 to 20 fathoms around; from it mount Batu Chinaga bears N. 62° W., and the western peak of Saddle hill N. 3° E., distant $9\frac{1}{2}$ miles.

Mount Kukusan kept well open to the southward of mount Putri, and bearing N.W. by W. $\frac{1}{4}$ W., leads to the southward of Darby bank and Hand rock.

Friedrich haven.—The channel, between Friedrich, Erzherzog and Ligitan reefs, on the south side, and the north-east shore of Sibuko bay on the north side, is 20 miles long from Trusan Tando Bulong to Egeria shoal, and varies in breadth from 3 to 5 miles, with depths from 6 to 8 fathoms, mud. The narrow part of the channel, about one mile in width between the 5-fathoms lines on either side, is between the western horn of the Ligitan reefs, which project to the north, and the shore bank, which shoals gradually. The horn of Ligitan reef can generally be distinguished and is steep-to.

On the north side the 3-fathoms line projects for $2\frac{3}{4}$ miles to the southward of Kumpong Kumpong island, and passes one-third of a mile outside Silungan islet.

Friedrich haven is the anchorage immediately off the Kumpong river and nearly in the middle of the channel, about $1\frac{1}{2}$ miles north of Erzherzog reef, in a depth of 6 fathoms.

Tides.—It is high water at full and change in Friedrich haven at 6h. 0m.; springs rise $7\frac{1}{4}$ feet, neaps $4\frac{1}{4}$ feet.

Tidal streams.—The flood stream sets to the southward and westward, and the ebb to the northward and eastward, with a velocity of three-quarters of a knot an hour.

Directions.—From the westward.—The summit of mount Connor (on the western side of Trusan Tando Bulong) in line with the north extreme of Silungan islet bearing N.E. $\frac{3}{4}$ E. leads up to the anchorage in Friedrich haven, passing between Egeria shoal and Roach reef, and close to the north-westward of Friedrich reef; the sandbank on that reef will generally be seen on approaching it. After passing Friedrich reef the summit of Manampili island kept on a N. 65° E. bearing will lead in mid-channel half a mile to the northward of the projecting western horn of the Ligitan reefs.

COAST. — **Balung river**, which emerges through the coast immediately to the westward of Saddle hill, is about three-quarters of a cable in breadth at the mouth, widening to 2 cables within the entrance. It takes its rise between mount Wüllerstorf and mount Lucia, and flows in a southerly and easterly direction to the foot of one of the spurs running down from mount Wüllerstorf, and thence turns south towards Saddle hill. The course of this river was traced by the steam cutter of the *Egeria* for 6 miles, or about 4 miles in a direct line from the coast, at which point the river was 30 yards wide with a depth of $1\frac{1}{2}$ fathoms; further progress being barred here by a fallen tree. In the lower reaches there is a depth of 3 to 5 fathoms; the mangrove swamp extends to about $1\frac{1}{2}$ miles from the coast; for the remainder of the river's course, as far as it was traced, the banks are lined by nipa palms.

The entrance to the river lies between two banks of sand and mud projecting in a southerly direction from the mouth; the bank on the eastern side dries for a considerable distance, that on the western side has 3 to 4 feet of water on it; the narrow channel between the two banks carries a depth of $1\frac{1}{2}$ fathoms at low water. The southern point of the eastern bank lies $2\frac{1}{4}$ miles S. $\frac{1}{2}$ E. from the western peak of Saddle hill.

Coast.—From Balung river a mangrove coast fronted by a mud flat that dries for one-third of a mile from the shore, trends W.S.W. for 12 miles as far as Batu Tinagat, and is only intersected throughout this length by the small river Apus. The bar at the mouth of this little river, which lies 5 miles from Batu Tinagat, has but one foot of water on it at low tide, and a whale boat was only able to ascend it for one mile.

A bank of sand and mud, awash at low water, and $2\frac{1}{4}$ miles long, east and west, lies $1\frac{1}{4}$ miles from the coast between Batu Tinagat and Apas river; its western extreme is situated 2 miles E. $\frac{3}{4}$ S. from Batu Tinagat.

Batu Tinagat is a small mushroom-shaped rock rising from the sea off a point formed by a spur of the Batu Chinaga hills; it is 15 feet high and bare. The point is the north-east entrance point of the strait separating Sibetik island from Borneo.

Tawao.—From Batu Tinagat the shore trends back a little to the southward of West, forming a bay $5\frac{1}{2}$ miles wide from Batu Tinagat to the entrance of the little river Tawao, $1\frac{1}{3}$ miles westward of which there is a small settlement formerly occupied by the Dutch, but likely in the future to be one of the stations of the British North Borneo Company. The mouth of Tawao river is concealed by a small mangrove islet, and at low water the entire foreshore is dry to a distance of a quarter of a mile from the coast. The shore of the bay eastward of Tawao consists of mangrove, fronted by mud flats which dry off to the distance of from a quarter to half a mile.

English spit.—The 3-fathoms line follows the coast from off Kumpang island to off Saddle hill at a distance of about 2 miles, with rocky ledges at its edge in places. From off Saddle hill it runs W.S.W. and then southerly, increasing its distance from the shore to $5\frac{1}{2}$ miles at a position 7 miles S.S.W. from Saddle hill; here it makes a sharp elbow, known as the English spit, and turns in a W. $\frac{1}{2}$ N. direction towards Batu Tinagat, passing that point at the distance of two-thirds of a mile.

The 5-fathoms contour-line, which is close to the 3-fathoms line off Saddle hill, makes a similar elbow at 2 miles south of English spit, and again closes the 3-fathoms line off Batu Tinagat.

Swirl patch is a narrow patch, a quarter of a mile long east and west, with a least depth of 13 feet over sand and 6 fathoms around, lying $1\frac{1}{4}$ miles from the coast between Batu Tinagat and Tawao. From the

shoalest spot mount Putri bears N. 38° E., distant $1\frac{1}{2}$ miles, mount Kukusan N. 55° W., and the west summit of Saddle hill, in line with Batu Tinagat N. 68° E. This patch makes itself visible by the swirl and eddies of the tide over it.

Tides.—It is high water, full and change, at Batu Tinagat at 6h. Onr. Springs rise $8\frac{1}{2}$ feet, neaps rise $5\frac{1}{2}$ feet. At Tawao, 6 miles further up the strait, the range of the tide was observed to be greater and is probably 11 or 12 feet at springs.

The tidal streams turn at the times of high and low water by the shore with a fair degree of regularity; the strength of the flood in the narrow part of the strait is $1\frac{1}{2}$ knots, and of the ebb about $1\frac{3}{4}$ to 2 knots. Between Balung river and Sibetik island the flood stream runs to the westward and the ebb stream to the eastward at the rate of from half a knot to one knot an hour.

Kalabakang river, flowing into the north-west arm of Sibuko bay northward of Sibetik island, was explored, together with the principal creek near its entrance by the steam cutter of the *Egeria*, for a distance of 22 miles following the course of the river, or 9 miles in a direct line from the mouth.

The mangrove swamp extends for 3 miles from the coast, higher up the banks are lined by nipa palms; the river varying in breadth from 30 to 40 yards, and with depths of from 2 to 5 fathoms, makes very sharp bends in places. At 6 miles in a direct line from the entrance the banks on both sides become higher with hard ground, and there are native huts with partially cleared land in their neighbourhood. The river here begins to wind about considerably, and in several places the depth decreases to one fathom.

At the furthest point reached by the boat the river was about 30 yards wide, but a line of rapids right across barred further progress. Here the water was fresh.

The rate of the current was about half a knot an hour.

Topography.—Westward of the Kumpang river the mountain system on the northern shore of Sibuko bay centres in mount Magdalena, with its peak situated in lat. $4^{\circ} 29' 52''$ N., long. $117^{\circ} 55' 56''$ E. This mountain, 4,420 feet in height, is densely wooded to its summit, and presents a sharp peak from all sides.

From mount Magdalena a high backbone extends in a south-south-easterly direction for 15 miles, terminating in mount Batu Chinaga, immediately to the northward of Batu Tinagat. On this backbone there are several very conspicuous elevations, notably mount Lucia 4,070 feet in height, Maria 3,680 feet, Andrassy 2,200 feet, and Batu Chinaga, 1,390 feet high, thus gradually diminishing in altitude towards the coast.

A secondary watershed branching at right angles from the main backbone springs from mount Lucia; this secondary system curving round to the eastward, and lower in altitude, eventually terminates in mount Wüllerstorf; whilst to the westward it forms a high ridge, which presently taking a southerly direction terminates in mount Kukusan close to the coast $1\frac{1}{2}$ miles N.N.W. from Tawao. On this ridge there are three other remarkable elevations.

The first of these, distant $3\frac{1}{2}$ miles from mount Lucia, is a high saddle, the south-western peak of which, 2,670 feet in height, is slightly the higher; the next is Table mountain, 1,980 feet high, perfectly flat topped, as its name indicates, which is situated nearly midway between mounts Magdalena and Kukusan. From Table mountain a spur running in a N.W. $\frac{1}{2}$ W. direction for $3\frac{1}{4}$ miles, terminates in a prominent peak 1,550 feet in height. The third elevation is Gemok, also a large flat-topped summit, 1,405 feet high, situated 2 miles N. by W. of mount Kukusan.

Lesser watersheds also branch away from mount Magdalena in north-westerly and north-easterly directions.

Coastmarks.—The principal coastmarks on the northern shore of Sibuko bay are very readily distinguished, and will be briefly noticed. The high summits of over 3,000 feet in height, such as mount Magdalena, Lucia, and Maria, are frequently obscured by clouds, but those of lower elevation are usually visible. Saddle hill, on the coast, and mount Wüllerstorf have already been described; *see* page 208.

Quoin hill, nearly 10 miles from the coast, is in the valley on the eastern side of the main backbone running to the southward from mount Magdalena, and 8 miles W. by S. $\frac{3}{4}$ S. from mount Wüllerstorf; it stands up in the plain very prominently, at an elevation of 1,965 feet.

Mount Andrassy, a rounded summit on the main backbone before mentioned, 2,200 feet in height, is the first prominent mountain to the northward of the Batu Chinaga hills.

Immediately behind Batu Tinagat there is a range of hills from 1,000 to 1,390 feet in height, and thickly wooded; mount Batu Chinaga, the northernmost and highest of the range, is situated nearly 2 miles N.N.W. from Batu Tinagat; a single tree on the summit stands conspicuously higher than its fellows. These hills fall steeply to the north, the range appearing isolated from the higher mountains further north.

Mount Putri, 1,020 feet high, is a spur of the Batu Chinaga range, close to the coast, westward of Batu Tinagat.

Mount Kukusan is a very remarkable pyramidal-shaped hill 730 feet high close to the coast $6\frac{1}{2}$ miles W. by N. from mount Batu Chinaga. It is quite unmistakable directly it opens out to the southward of mount Putri

on a W.N.W. bearing, and it remains clearly in view until it begins to close the higher land of mount Gemok behind.

Directions from Friedrich haven to Tawao.—The **inner route** passes south of Lehnert reef and north of Heel reef, and is perhaps the most convenient route to follow as the shore marks are comparatively near and well in view. From a position one mile northward of Friedrich reef, the sand cay on which will be distinguished, a course W. $\frac{3}{4}$ S. will lead three-quarters of a mile south of Lehnert reef, and the same distance north of Heel reef, and when Saddle hill bears N.W. by N. a course S.W. $\frac{3}{4}$ S. for 8 miles will pass one-third of a mile south-eastward of the elbow in the 5-fathoms line off English spit, and $1\frac{1}{2}$ miles to the north-west of Hand rock; the latter is a danger specially to be guarded against.

The soundings give ample warning on approaching the south-east side of English spit, and maintaining a depth of 7 to 8 fathoms will ensure passing it at safe distance. On opening out mount Kukusan well clear to the southward of mount Putri bearing N.W. by W. $\frac{3}{4}$ W., a vessel should steer W. by N. $\frac{1}{4}$ N. up the channel; and on arriving off mount Putri, should take care not to bring mount Kukusan to the westward of N.W. $\frac{3}{4}$ W. in order to avoid Swirl patch, which danger will be passed when Saddle hill is lost sight of beyond Batu Tinagat. The anchorage off Tawao is in a depth of 8 to 10 fathoms water, but it must be borne in mind that the edge of the bank is very steep off the point, and shoals suddenly from 8 fathoms to one fathom.

The outer route from Friedrich haven passes to the southward of Chance rock and Egeria shoal, and between Alert patches and Hand rock. Keeping mount Connor in line with the north extreme of Silungan islet, bearing N.E. $\frac{3}{4}$ E., a straight course leads three-quarters of a mile to the southward of Hand rock, and in clear weather no difficulty will be experienced in fixing the position of the ship by cross bearings.

SIBETIK ISLAND is about 20 miles in length in a W.N.W. and E.S.E. direction and about 7 miles in average width; it is separated from the mainland to the north-east by a strait $3\frac{1}{2}$ to 5 miles wide, but to the north-westward there is only a narrow channel half a mile in width separating it from the Saodan delta on the mainland. A range of densely wooded hills traverses the island throughout its length, the highest point of this range, mount Antoinette, 1,550 feet in height, is in the middle. Cornelis peak, 550 feet high, near the eastern end of the island, is a somewhat conspicuous point when viewed from any direction to the southward of south-west, but is less remarkable from other views.

The north-east and east coasts only of this island were surveyed by H.M.S. *Egeria*. The whole of the north-east shore is fringed by man-

grove swamps, but at the north point of the island there is a break in the continuity of the mangroves revealing a grassy patch of land, with reddish coloured cliffs.

The boundary line between British and Dutch territories on the parallel of lat. $4^{\circ} 10' N.$ passes nearly through the centre of Sibetik island.

Saima head, immediately opposite to Tawao on the other side of the strait, is the north-western limit of the detailed survey of this coast; it is a mangrove point fronted by mud flats which here skirt closely the edge of the mangroves, but widen outwards as the coast trends to the south-eastward towards East point.

At $4\frac{1}{2}$ cables N.N.E. from Saima head there is a small sand bank that dries 4 feet at low water, with a depth of 8 fathoms between it and the shore.

Boundary beacons.—At $1\frac{5}{16}$ miles S.E. from Saima head there is a stone beacon on the edge of the mangrove swamp to mark the exact spot where the parallel of $4^{\circ} 10' N.$ cuts the coast line; its position having been determined by joint observations on the part of British and Dutch officers. A similar beacon marks the spot where the boundary parallel meets the south-western shore of the island.

Boundary beacons have also been placed on the mainland at Burs point, and on the northern bank of the Simengaris river in long. $117^{\circ} 23' E.$, on the parallel of lat. $4^{\circ} 10' N.$ to mark the separation of British and Dutch territory.

East point, situated S.E. $\frac{1}{2}$ S. $4\frac{1}{2}$ miles from Saima head, is a rounded point with a hard sandy beach, backed by high casuarina trees. The sand and mud flats dry off to a distance of $1\frac{1}{2}$ miles eastward of this point, but they are not so soft as the flats of unmixed mud further to the northward.

At $1\frac{1}{2}$ miles northward of East point, and one mile from the coast, there is a sand bank that dries 4 feet, it is separated from the mud flats fronting the shore by a narrow channel.

The 3-fathoms and 5-fathoms lines pass close outside this sand bank, and the edge of the shallow water is very steep to all along the shore from Saima head to abreast of East point, from which these contour-lines are distant 2 miles; the depth decreases suddenly from 6 to 2 fathoms.

Stone point.—From East point the coast trends to the southward with a slight indentation for $3\frac{1}{2}$ miles to Stone point: the sandy beach in this bight is backed by red cliffs from 20 to 80 feet high, the country behind is low and densely wooded. Off Stone point there are several patches of rocks that dry at low water, and at $1\frac{1}{2}$ miles to the south-westward of Stone point there is a very small islet close to the coast which from thence trends south-westerly and westerly for $3\frac{1}{2}$ miles to the south point of the island.

Dutch spit.—Eastward of Stone point the 3-fathoms contour-line projects in a sharp elbow to a distance of $5\frac{3}{4}$ miles from the coast; from the extremity of this spit, which is known as Dutch spit, the southern extreme of Sibetik island bears W. by S. $\frac{1}{4}$ S. and mount Batu Chinaga N. by W. $\frac{1}{4}$ W. A detached shoal with $2\frac{3}{4}$ fathoms on it lies $1\frac{1}{2}$ miles N.N.W. from the end of the spit. The 5-fathoms line extends $1\frac{1}{4}$ miles eastward of Dutch spit.

Vessels approaching Tawao from the southward should be careful in rounding Dutch spit, more especially on the flood tide.

Padang bank, lying 2 miles S.S.E. from Stone point, has on it a patch that breaks, with only 3 feet water over it, from which the south point of Sibetik island bears W. $\frac{1}{4}$ S.

Mangkassar banks, portions of which dry at low water, are two banks lying east and west of each other, and are together nearly 3 miles in length within the depth of one fathom; they are narrow, and steep to on both the north and south sides. The western edge has not been defined; from the eastern end of the bank in a depth of 3 fathoms, mount Batu Chinaga bears N. $\frac{1}{2}$ W., and the south point of Sibetik island W. by N. $\frac{1}{4}$ N., distant about 8 miles. A ridge extends eastward from the shoal extremity of these banks, to a distance of $3\frac{1}{4}$ miles within the limit of the 5-fathoms contour-line.

The channel between Mangkassar and Padang banks has a depth of 6 to 7 fathoms in it, but in view of the survey having terminated short of its western end it would be imprudent to attempt to pass through it.

Unarang rock is a small rocky patch that dries one foot at low water, springs, with 9 to 20 fathoms close around. It is situated just outside the edge of the 20-fathoms contour-line, with mount Batu Chinaga bearing N. 24° W., distant $15\frac{1}{2}$ miles, and the south point of Sibetik island W. $\frac{1}{4}$ N., and forms the southernmost outer danger in the approach to Tawao. The main entrance to the strait north of Sibetik island lies between Unarang rock and Hand rock, $9\frac{1}{4}$ miles to the north-east.

A patch of 3 fathoms with no soundings around it is charted in lat. $3^{\circ} 51' N.$, long. $118^{\circ} 11' E.$

Banda reef is a coral reef with a depth of 6 feet over it, situated in lat. $3^{\circ} 49' N.$, long. $118^{\circ} 0' E.$

SIBUKO RIVER appears to be large and important; the entrance is divided into two arms by the island East Nonokong; on the bar at the mouth of the southern entrance a least depth of $4\frac{1}{2}$ fathoms is shown on the chart. A shoal spit with 3 fathoms at the end is shown as extending 7 miles to the eastward of Nonokong island.

The coast of Borneo southward of latitude $4^{\circ} N.$ is described in Eastern Archipelago, Part II.

CHAPTER V.

VERDE ISLAND PASSAGE TO ILOILO.

SOUTH-WEST COAST OF LUZON TO SIGAYAN POINT—NORTH
AND EAST COASTS OF MINDORO — TABLAS AND
ADJACENT ISLANDS—WEST COAST OF PANAY.

Variation $0^{\circ} 50'$ East in 1902.

VERDE ISLAND PASSAGE.—Verde island passage is the name given to the strait that separates the south-west part of Luzon from the north coast of Mindoro. It is constantly used by vessels trading between Manila and Iloilo, Sebu, and other ports in the Philippines, and is the western entrance of the route through San Bernardino strait, formerly used by the galleons, to Acapulco, in America.

Verde island divides the strait into two passages, either of which may be taken, but that north of Verde island is preferable as the southern one is interfered with by the Bakos islets. The tidal streams in the channel are very strong, attaining a rate of 3 to 4 knots at springs; the flood stream sets to the eastward, and the ebb to the westward. There are no records of the tidal hours, but they are reported to be the same as at Manila.

In this chapter is described the route through Verde island passage, down the east coast of Mindoro, and the west coast of Panay, to Iloilo. The description being taken from the Spanish Derrotero of 1879.

SOUTH-WEST COAST of LUZON.—Cape Santiago is moderately high, wooded, and surrounded by a reef which extends about a cable from the shore, and dries. The depth at the edge of the reef is from 4 to 5 fathoms, deepening abruptly to 44 and 55 fathoms at the distance of half a mile.

LIGHT.—From a conical brick tower 51 feet in height, near the south point of cape Santiago, is exhibited at an elevation of 90 feet above high water, a *group-flashing white* light with a period of *thirty-six seconds*, visible at a distance of 16 miles in clear weather between the bearings of $S. 38^{\circ} E.$, through east and north, to West.

See chart, No. 2,577 [2,656].

The light shows *three* consecutive flashes of *four seconds* each, with eclipses intervening; interval between flashes *two seconds*, between groups of flashes *twenty seconds*.

Position.—Lat. $13^{\circ} 46' N.$, long. $120^{\circ} 39\frac{1}{2}' E.$

Telegraph.—There is a semaphore and telegraph station on cape Santiago, in connection with Manila.

Minerva rock, on which the *Minerva*, of Alloa, is reported to have struck at 2 a.m., September 10th, 1834, is said to be a coral rock, with a depth of 17 fathoms near it, and bearing from cape Santiago S.E. $\frac{1}{2}$ E., distant 4 or 5 miles. The rock was searched for unsuccessfully by the Spanish Hydrographic Commission under Captain D. Claudio Montero, and has been erased from the Spanish charts.

Pagapas bay, between cape Santiago and San Pedriño point to the northward, is very deep; the shore is fringed by a narrow reef with depths of 7 fathoms near its edge. Anchorage may be found on the eastern side of the bay in 7 fathoms; the western part is rocky. At the bottom of the bay is the little port of Kalaboso, formed by a break in the reef; the entrance is difficult, and the place is only frequented by coasters.

San Pedriño point is surmounted by a hillock; it is well wooded, and is encircled by a reef that extends to the distance of one cable from the shore.

BALAYAN BAY, the great bay between cape Santiago and Benagalet point, is clear of danger, with bottom of sand and mud, but the shores are so steep that a vessel must approach very close to it to get within a depth of 12 fathoms.

Winds and Tides.—The winds in this bay follow the monsoons generally; the land breeze blows nearly every evening. The flood stream makes to the southward, and the ebb to the northward.

Balayan town, at the mouth of the river of that name, is situated 6 miles northward of San Pedriño point; there is anchorage to the eastward of the river in 3 to 6 fathoms, sand and rock, sheltered from all winds but those from the southward. Only boats of light draught can enter the river, as the depth on the bar is only 3 feet at high water. Mount San Pedriño lies 3 miles W. by S. $\frac{1}{4}$ S. from the anchorage. The town contains about 16,200 inhabitants, and affords supplies of all kinds.

Taal lies $11\frac{1}{2}$ miles E. by S. $\frac{1}{2}$ S. of Balayan, the coast between being low and sandy, but steep-to. This important town, of about 22,000 inhabitants, is at the entrance of the river Pansipit, into which vessels of 100 tons burden can enter. The best anchorage is northward of the mouth of the river near the shore, in a depth of 7 fathoms, sand, with the

fort of Taal in line with mount Makolog; it is sheltered from all winds from north to south through east. There is a depth of 7 feet at high water on the bar of the river, which flows from Taal lake and enters the bay about a mile from the town. The inhabitants of Taal, as also those of Balayan, are engaged chiefly in agriculture, rearing cattle, and in fishing. Provisions are plentiful, and there is active commerce with the province of Manila.

Taal is a telegraph station.

Benagalet point, the western extreme of Kalumpan peninsula, is a rocky bluff fringed by a narrow reef, which runs all round the south-west end of the peninsula to near Cazador point. This part of the coast is clean, with depths of 25 fathoms close to it.

Cazador point is the south end of Kalumpan peninsula, which separates the bays of Balayan and Batangas; the peninsula, 7 miles in length, is formed by a tongue of land of regular height, covered with trees. Off the point, and joined to it, are some rocks; on its eastern side there is a narrow reef, with depths of 3 to 11 fathoms at the distance of half a cable, deepening abruptly to 65 fathoms at 2 cables from the southern part.

BATANGAS BAY, contained between Cazador point and Malokot point, 8 miles to the E.S.E., penetrates 9 miles to the northward; it is clear and deep, with steep coasts. From Cazador point the coast for 6 miles to the N.N.E. is rocky and wooded; it can be passed at the distance of one-third of a mile. From thence the coast is low, with sand beaches intersected by the little rivers Balito, Bauang, Batangas and Kalumpan.

Batangas river, which enters the bay near the town of the same name, is very shallow, and a canoe can hardly enter it at low water; even at high water boats have a difficulty in ascending it. There is a watering place at a little distance within the mouth, and further up, the river divides into two branches; one branch after some windings passes close to the town of Batangas, of about 35,600 inhabitants, at three-quarters of a mile from the mouth; the other branch joins the river Kalumpan. Westward of the mouth there is a sand-bank, which is mostly uncovered at low water.

Lights.—Anchorage.—On the south side of the entrance to Batangas river there is a pier, about 130 yards in length, the outer end of which is marked by two horizontal *red* lights.

Anchorage may be taken in a depth of 15 fathoms at the distance of about 3 cables S.W. $\frac{1}{2}$ W. from the pier-head. Fishing stakes are placed all along this part of the coast, at about one cable from the shore; there is an opening in the stakes abreast the pier and river.

Kalumpan river enters the bay three-quarters of a mile southward of the Batangas river. The bank which forms its bar is 2 cables wide, and uncovers at low water, so that it is difficult even for the lightest canoes to enter. The river brings down volcanic ashes and pieces of pumice stone, which together form both its banks and the bar, and cover part of the bottom in the neighbourhood.

Coast.—From the river Kalumpan the coast trends to the southward, forming a small bay with a beach of sand and mangroves, ending in a little point at $1\frac{1}{2}$ miles from the river. The bank of sand which commences at the mouth of the river Batangas and borders all this part of the coast at a distance of 2 to 3 cables terminates here. This bank dries in places at low water; the depth near its edge is from 7 to 12 fathoms, mud, increasing to 80 fathoms at the distance of less than 2 miles.

Pinamukan point lies S.S.W. 3 miles from the little point where the bank ends; the coast between these points is of regular height and well wooded, with a depth of 5 fathoms close to the shore, and 40 fathoms at the distance of one mile. Eastward of Pinamukan point is the mouth of a small river of the same name as the point; fresh water may be obtained from this river, but with difficulty, as it is necessary to go some distance up for it, and the river is very shallow. From Pinamukan point the coast trends about S.S.W. for 3 miles to Malokot point, and is of regular height and wooded, with detached rocks close to the shore.

Anchorage.—From Bauang point to Pinamukan point the coast is formed of sand beaches, and vessels can anchor off it, but necessarily very close to the shore, on account of the great depth of water. Between Bauang and Batangas a depth of 14 fathoms, mud, will be found at less than 2 cables from the shore, and this anchorage is preferred by the vessels that frequent the coast, on account of its good holding ground and its proximity to those two towns.

MARIKABAN ISLAND, lying south-westward of the Kalumpan peninsula, at the distance of nearly 2 miles from Cazador point, is 7 miles long E.S.E. and W.N.W., high, and covered with trees, amongst which the useful Buri palm (*Corypha Gebanga*) is frequent. On its eastern end there is a remarkable mountain that commands all parts of the island; at the western end there is another, not so high, terminating in a peak which can be seen very distinctly from the neighbourhood of cape Santiago. The whole coast of the island is bordered by rocks, and two rocky islets, named Kaban and Sombrero, lie off the north-western end, and two others, Culebra and Malajibomanok, off the eastern end.

The islet Kaban, to the eastward of the north-western point of Marikaban, is one mile long north and south, of moderate height, and wooded; a shoal of one cable extent, and covered by $3\frac{1}{2}$ fathoms least water, lies

See chart, No. 2,577 [2,656].

2 cables north of its northern end. Sombrero islet, 40 feet high, lies half a mile north of the north-western point of Marikaban, and is joined to it by a chain of rocks; a similar islet lies close to the point and is also connected with it by rocks.

Shoal.—At $9\frac{1}{2}$ cables S. 28° W. of the north-west end of Marikaban there is a shoal of 4 cables extent N. by E. and S. by W., covered by less than one fathom water; between it and the coast there is a channel 6 cables wide and 16 fathoms deep.

Culebra islet lies 3 cables E. by S. of Marikaban; it is 2 cables in extent E.S.E. and W.N.W., and wooded; some detached rocks awash lie south-east of it.

Malajibomanok, lying 7 cables eastward of Culebra, is small, flat, with a few trees on the middle, and is surrounded by rocks which project to the E.N.E. about a quarter of a mile. In the channel between Malajibomanok and Culebra there is a depth of 22 fathoms.

Reef.—The French Instructions mention a reef extending half a mile from the north coast, with several heads above water, bearing S.E. from Cazador point; this reef is not mentioned in the Spanish Derrotero, but the Spanish chart, 1875, shows a depth of 2 fathoms half a mile north of the north-east point of Marikaban.

Marikaban strait, between Marikaban island and Cazador point, is clear and safe, the only danger being the shoal that extends to 3 cables north of Kaban islet. The strait is only used by coasters, which can anchor in case of need near the island; but the tidal eddies are very violent, and the anchor must be let go so close to the rocks that there is danger of being driven on shore before it bites. The channel south of Marikaban is clear and deep, and is always used in navigating Verde island passage.

VERDE ISLAND, from which the passage takes its name, is 1,500 feet in height, well wooded, and shows two peaks said to be visible at a distance of 42 miles. It can be approached with safety, though there are detached rocks close to the shore; off the south-east point there are some rocks that are said to uncover at the distance of 3 cables from it. On the north side of the island there is a bay in which the depth is 10 to 15 fathoms near the shore, with a high coast and occasional sand beaches; it affords shelter in southerly winds.

Verde island, with the south coast of Luzon to the north of it, and the north coast of Mindoro and Bakos islands to the south, forms the two channels of Verde island passage; both are safe, but the northern channel is preferred, as the southern one is interfered with by the Bakos islets (*see* page 231).

COAST of LUZON.—**Malokot point**, which forms the eastern extremity of Batangas bay, is high, precipitous, and wooded, with one low point to the south-west. The coast to the eastward is rocky for $1\frac{1}{2}$ miles as far as a sloping point (Ilijan); it then forms a slight indentation, ending to the eastward in Arenas point. In this bay small coasters find anchorage during the north-east monsoon, to avoid the ebb stream. The shores of this part of the coast are covered with the *Palo Maria*, a tree of the natural order Guttiferae, which yields a valuable gum.

Arenas point, the second point from Malokot, consists of sand and stones, which serves to distinguish it; it is low and clean, and the tidal streams rush past it with great force. **Talaji point**, $1\frac{1}{2}$ miles E.N.E. of Arenas point, rocky and wooded, is not prominent; to the westward of the point good water can be obtained which comes from a valley of mount Talaji. From here to Rosario point, $3\frac{1}{2}$ miles E.N.E., the coast is covered with trees, and shows a sandy beach fringed by rocks close to.

Rosario river debouches at $2\frac{1}{2}$ miles from the point of the same name; it is half a cable wide at the mouth, and the two points which form the entrance are both prolonged by a spit of sand half a cable in length. The bar is one cable in width, and composed of sand and gravel with rocky patches on it; the channel, which is between the bar and the north-west entrance point, is hardly half a cable wide and only 3 or 4 feet deep at low water, which depth diminishes further up the stream. The river divides into two branches; fresh water can be obtained from the northern arm, but canoes must be used to get it. From Rosario river to Malabrigo point the shore is sandy, wooded, and of regular height.

Anchorage can be found in northerly winds between points Malokot and Malabrigo, but the shore is very steep, and at less than 2 cables from it the depth is from 8 to 13 fathoms; bottom, coarse sand and gravel.

Malabrigo point is the western point of the broad headland formed by the spurs of the Sierras de Lobo; Punas point is the central, and Malagundi the eastern point of this headland. The coast comprised between them is of moderate height and well wooded, rocky between Malabrigo and Punas, and bordered with a sandy beach and rock from here to Malagundi, off which point lies a small islet surrounded by rocks. Punas point is remarkable by some red patches at a short distance from the beach, and the Sierras de Lobo, 3,363 feet high, serve to indicate the position from the south-east.

LIGHT.—On Malabrigo point, at an elevation of 185 feet above high water, a *group-flashing* light is exhibited showing alternately *two white flashes* and *one red flash*, every *twenty seconds*, visible in clear weather from a distance of 20 miles.

The lighthouse is a red brick tower 48 feet high, with a white lantern above the keeper's dwelling.

Sigayan or Lokoloko point.—From Malagundi point the coast shows the same sand beach for 4 miles to the little river Sigayan, where the high land of the Sierras behind Punas point terminates. The river is narrow and shallow, and fresh water can be obtained at a little distance from the mouth. No description of Sigayan point itself is to be found in the Spanish Derrotero.

Anchorage.—Vessels can anchor between Malagundi and Sigayan, but close to the shore, which is very steep. The bottom is generally of coarse sand mixed with gravel.

The description of the coast to the eastward is continued in Chapter VIII.

NORTH COAST of MINDORO.—Mindoro is an island of an oval form with a prolongation of the northern portion towards the west; it is about 90 miles in length and 50 miles wide, with an area of about 4,000 statute square miles. Though distant but 80 miles from Manila, this island is, relative to its size, one of the least populous of the archipelago, being extremely mountainous, covered with dense forests, and in the more level part near the coast full of marshes and very unhealthy. The inhabitants of the coasts are Tagals, but in the interior there is a low tribe of Malayan race, probably the indigenes of the island, and called Manguianos, speaking a peculiar language and living in a very miserable manner on the products of a rude agriculture. There are also said to be some Negritos, but of these very little is known.

Mindoro constitutes one of the provinces of the Philippines. The chief town is Kalapan, on the north coast, and there are nine other pueblos or villages, with curés and native chiefs, all situated round the coast. The population of Mindoro in 1899 was estimated by the Philippine Commissioners to be about 173,000, of whom a large number are wild tribes in the interior.

Mount Kalavite is a long-backed promontory, the western slope of which forms cape Kalavite, and the northern slope del Monte point; the summit, about 2,000 feet high appears dome-shaped when seen from the west, but from the north or south it shows a long ridge fairly level; the western end of this ridge is the highest part. Cape Kalavite and the coast to the southward have been described in Chapter II.

Binuangan point, 4 miles N.N.E. of cape Kalavite, resembles it in appearance, and is bold to approach, the few rocks interspersed along this part of the coast lying close in.

Anchorage.—South of Binuangan point there is a small bight with a sand beach, in front of which there is anchorage during the north-east

monsoon in a depth of $5\frac{1}{2}$ fathoms, sand, at $1\frac{1}{2}$ cables from the beach. A rivulet of good water enters here. There is another anchorage immediately north of cape Kalavite, but it is not so good.

Point del Monte is of sand, with a small bank of one fathom off it; between point del Monte and Abra de Ilo, 20 miles eastward, the coast is high, thickly wooded, and bordered by sand beaches. Bagalayag point is girt with rocks which extend a mile along the coast.

Abra de Ilo, lying between two hills, is easily recognised by the deep depression in the coast range forming a low narrow plain, with a slightly indented cove, bordered by a sand beach 2 to 3 miles long. Shelter may be obtained here during S.W. winds, in depths of from $3\frac{1}{2}$ to 15 fathoms, sand; the water shoals suddenly, the former depth being found at less than one cable from the shore. The off-shore squalls are very violent. Towards the middle of the cove there flows a fresh water river, which can only be entered by small coasters and *bancos* at high water. The village contains about 250 inhabitants.

Coast.—From Abra de Ilo to port Galera the coast, which is of moderate height, and shows a few points separated by beaches, can be approached in safety to the distance of half a mile. The high land approaches the coast, and two watercourses descend from the ravine.

Minolo point, 2 miles west of port Galera, is covered with trees; there is a beach on its eastern side before which anchorage can be had on a bottom of sand and gravel. The shore is steep, and the depth 25 to 30 fathoms at the distance of 3 cables from it.

PORT GALERA is situated between a promontory projecting from the coast of Mindoro, and the islands Medio and Panikian. These islands, lying at the entrance of the bay, close north-westward of the peninsula form the port, which has two passages, one on either side of Medio island; there is no practicable entrance southward of Panikian.

The flood stream enters the port by the north-west channel and passes out by the north channel, and then follows the trend of the land to the eastward; the reverse conditions take place with the ebb stream. This fact should be remembered when making the port.

From Escarceo point, the eastern extremity of the promontory, to the north point of Medio island, the shore presents a uniform appearance, and the north channel is not readily seen; but a signal post at the north-east point of entrance and a remarkable white patch like a sail on the fall of the point, serve to indicate it. The land above the shore is covered with trees.

Medio island, about 8 cables in length, N.N.W. and S.S.E., has a high and jagged western coast, with rocks and a reef extending half a cable from its south-west point; a reef and shoal flat fringes its north-eastern

shore to the distance of about three-quarters of a cable; the 5-fathoms contour-line lies a cable further off. There is a tide race off the bare rocky north point.

Panikian island is half a mile long north and south, and ends in a sandy point forming with Mindoro a channel half a cable wide, closed by sand; this is called "Boca falsa." It is fringed with reef on its north and east sides for a short distance.

DIRECTIONS.—North channel.—After clearing the north point of Mindoro, keep in the middle of the channel, where the depth is $6\frac{1}{2}$ fathoms, coarse sand and rock; it is a cable wide at the entrance, but lessens to half a cable abreast the east point of Medio, which is low and bordered with a sand-bank.

During the north-east monsoon the north channel is the best, but with sailing ships, even this channel is dangerous, as calms or baffling winds may be experienced, and the tidal streams are strong.

North-west channel.—A vessel from the westward should steer for the middle of Medio island, or for a clump of mangroves on its south-west point when made out, until the entrance is opened, and then keep midway between Medio and Panikian islands to the anchorage. This channel is narrowed at the entrance to half a cable's width by the rocks off the south-west point of Medio, but it widens inside to 2 cables: the least depth is $6\frac{1}{2}$ fathoms at the entrance, increasing inside to 14 fathoms.

Anchorage.—The available space inside the islands is considerably reduced by projections from the promontory of Mindoro of low land with shoal water between them, and by a shoal that advances from the southern part, having on its north-eastern end rocks that are awash at very low water. The anchorage for small craft is in a confined creek in the south-west part; at the entrance, which is one cable wide, the depth is $6\frac{1}{2}$ fathoms, shoaling towards the town of Galera on the southern shore. At $1\frac{1}{2}$ cables north of the mouth there is another shoal with rocks awash at low water on its southern part. Between this shoal and Boca falsa there is a space of $1\frac{1}{2}$ cables width, and depths of 7 to 10 fathoms where there appears to be better anchorage.

The town contains about 1,300 inhabitants; water is scarce.

Escarceo point, so named from the tide rips off it, is of jagged rock, covered with trees; the shore between it and Boaya point, $1\frac{3}{4}$ miles to the south-west, is clear, with deep water off it. The currents run here with great velocity, causing strong eddies.

Varadero bay is open to the south-east.; it is $4\frac{1}{2}$ cables across at the mouth, half a mile in depth, and affords good anchorage in both monsoons, especially during the south-west season, when the heavy squalls pass to the

northward of it. It is decidedly preferable to port Galera, especially in bad weather. The best anchorage for large vessels is in a depth of 7 to 10 fathoms, S.E. of the fort at port Galera, at the distance of about $2\frac{1}{2}$ cables from the sand beach, and at about equal distance ($1\frac{1}{2}$ cables) from the two rocky points at the head of the bay.

Boaya point is clear, but the southern point of the bay, Varadero, sends out rocks to a cable's distance which are awash at low water, and beyond which foul ground extends half a cable.

Subaang is a little town on the summit of a hill at a distance of 6 miles S. by E. $\frac{1}{4}$ E. from Escarceo point; near the town there is a bay with anchorage sheltered from the S.W. in a depth of 7 fathoms, sand.

Shoal.—A shoal of $3\frac{1}{2}$ fathoms is charted at the distance of $1\frac{1}{2}$ miles east of the town. The Spanish Derrotero remarks that this reef is dangerous, as the water over it is of the same colour as that surrounding.

The French Instructions Nautiques state that to the east of the town, at the distance of half a mile from the shore, is the furthest point of a bank of sand and rock, on the edge of which the depth is $3\frac{1}{2}$ fathoms.

COAST.—From the bay of Subaang the coast curves gently round to the eastward, and at the distance of 3 miles a delta commences formed by the washings of the river Bako and others, producing 4 miles of broken coast line, cut into by bars and passages as far as point Balete, the western point of the bay of Kalapan.

A reef of sand and rocks extends to the distance of $3\frac{1}{2}$ cables from Balete point.

Depths.—A bank, with 13 fathoms over it, lies northward of the mouth of the river Bako, distant therefrom nearly a mile.

From Balete point in the direction of the Bakos islets, the depths are $4\frac{1}{2}$ fathoms at the distance of two-thirds of a cable, 75 fathoms at 2 cables, and upwards of 100 fathoms at the distance of 3 cables.

Kalapan.—This town is the capital of the province of Mindoro, and contains 4,700 inhabitants; there is a church here, and a conspicuous two-storied tower. The commerce is insignificant. Sand-banks front the town to the distance of half a mile; to clear these the northern Silonay islet should not be shut out by Tibao point.

The U.S.S. *Annapolis* anchored here in a depth of $4\frac{1}{2}$ fathoms, mud, with the tower bearing S. $\frac{3}{4}$ W., and Tibas point N.E. by E. $\frac{1}{4}$ E. Great caution must be observed in approaching this anchorage, as, from depths of 36 to 46 fathoms, the water shoals very suddenly.

Directions.—The safest course to pursue when entering or leaving this bay is to keep in the middle of the passage between the Bakos islets and the coast of Kalapan; and, when the southernmost of these islets bears north to steer for the anchorage.

Tibao point, the eastern point of Kalapan bay, is low and wooded, and has on its summit a *cogonal* or reed plantation; the point is clean, but a narrow fringe of rocks borders the beach south-eastward, with deep water close to it.

Silonay islets.—The small southern islet of that name, one mile E.S.E. of Tibao point, is shaped like a sugar loaf, and surrounded by rocks; the channel between it and the coast has a depth of less than 5 fathoms, and is only fit for coasters. At half a mile from the smaller islet, and one mile N.E. by E. of Tibao point is the larger Silonay islet, which is fringed with rocks that project on the northern side to the distance of $1\frac{1}{4}$ cables. Between the islets the passage is 3 cables in width and 20 fathoms deep; vessels should be careful to keep in about the middle of it.

Bakos islets.—This is a group of three rocky islets, extending 2 miles north-east and south-west situated N.N.W. $2\frac{1}{2}$ miles from Tibao point. The vicinity is foul, and the chart shows a danger on the northern side of the northern islet. A shoal of $1\frac{1}{2}$ fathoms lies one mile S.W. of South Bakos. In the middle of the passage between the northern and middle Bakos there are rocks which uncover; in the other channels the depth is sufficient for navigation, but the rapid currents that prevail here make it imprudent for a vessel to take them.

The N.E. COAST of MINDORO.—From Tibao point to Naujan, 13 miles to the south-east, the coast is low and thickly wooded, with beaches of sand cut into by various rivulets and estuaries, which can only be entered by boats at high water. At a distance of one cable from the shore the depths are $4\frac{1}{2}$ to 7 fathoms, sand and mud, and at half a mile from Naujan $5\frac{1}{2}$ to 8 fathoms, fine sand. The rivers to the north-west of Naujan send out sand banks with only a quarter of a fathom on them for the distance of 2 cables. The chart shows shoal water at the distance of three-quarters of a mile from the shore.

Naujan river and bar.—The river Naujan can only be entered by boats, it being fronted by an extensive bar with a depth of 6 to 7 feet at high water; the width at the mouth is one cable. There is anchorage one mile south-east of the river in a depth of 9 fathoms, sand and mud, shoaling gradually towards the coast. From Naujan to Polak bay the coast is steep.

Tajud point has a large insulated rock or cliff off its east side, joined to the coast by a rocky spit. Tagusan point, one mile south-east of Tajud point, has detached rocks off it, with a depth of 10 fathoms near them.

Polak bay, open to the N.E., is clear of dangers; anchorage may be had in 14 fathoms, mud, with Polak church bearing S.W. $\frac{3}{4}$ W., and Dumali point E. $\frac{1}{4}$ N., or in a depth of 10 fathoms north-westward of the above position. The water shoals suddenly. Anahauan point, the northern point, is fringed with reef to a distance of 3 cables, with depths of $2\frac{1}{2}$ to

5 fathoms at its edge. The bottom of the bay is a sandy beach, 2 miles long, between two rivers; fresh water can be obtained in boats from the eastern river.

Dumali point, the eastern extreme of Mindoro island, and formed by the termination of the shoulder of mount Dumali, is high, peaked, and may be recognised by a patch bare of trees 400 feet above the sea. The depths are 49 fathoms close off Dumali point, and 37 fathoms at the distance of less than a mile from the rounded coast to the southward.

DIRECTIONS for Verde island passage.—After rounding Cape Santiago at the distance of a mile, S.E. by E. $\frac{1}{4}$ E. is a good course until abreast the south point of Marikaban island; from thence pass between Verde island and Malokot point in Luzon. Verde island can also be passed on the south side, but the ledge of rock extending from the south-east point of Verde island, and the danger northward of the northern Bakos islet must both be avoided. The North channel is much to be preferred, more particularly at night, when Malabrigo light kept on the bearing E. $\frac{1}{4}$ N. will lead through in mid-channel.

When well past the north-east point of Verde island, a course S.E. $\frac{1}{4}$ E. will lead one mile east of the northern Bakos islet, and, if continued for 40 miles, will pass 3 miles north-east of Dumali point; thence a course S. $\frac{3}{4}$ E. may be steered to pass down the west coast of Panay.

EAST COAST of MINDORO.—From Dumali point, to the southward as far as Pinamalayan river, the coast is steep-to; from thence on to Dayagan point the shore, consisting of sand beaches, may be approached to within a mile, and vessels can anchor anywhere along it, sheltered from westerly winds, in a depth of 4 fathoms at a distance of 2 miles, and in 3 fathoms at one mile. In the elbow of the coast north-west of Abongabon point, off the river Masi, there is excellent anchorage during south-west gales in depths of from 4 to 7 fathoms, sand. A reef of rocks awash at low water extends 2 cables out from the mouth of the river. The charts show scarcely any soundings about this coast.

Dayagan point is flat and sandy, steep-to and clean, with the depth of 4 to 5 fathoms at the distance of $1\frac{1}{2}$ cables from it.

Point Tiklin or Lagoin, $4\frac{1}{2}$ miles south-west of Dayagan point is flat and sandy; at less than half a mile E.S.E. of it there is a bank of rocks one cable in extent, uncovered at low water, with $3\frac{3}{4}$ fathoms at its edge. One mile further out to the S.E. there is another bank, 3 cables in extent, awash at low water, with depths of 4 to 8 fathoms at its edge. The channel between these shoals has a depth of 15 fathoms in the middle.

Mansalay bay is small but well sheltered, with good holding ground. Vessels of any size can anchor in it, sheltered from all winds except those from

the S.E. The best anchorage in the north-east monsoon is in the north part of the bay, in a depth of 7 fathoms, mud, 2 or 3 cables distant from the shore. The town of Mansalay is small, with a population of about 300. Water can be had from a rivulet, but with difficulty, as boats cannot enter it.

Directions.—In approaching this anchorage from the northward, do not bring Dayagan point to the eastward of north until the entrance of the bay is made out and bears about West, in order to clear the Lagaoín banks which partly uncover at low water. In entering the port, care must be taken not to approach the north shore, which is bordered by a reef. There is a depth of 5 fathoms in the middle of the port, and in the southern part one to 3 fathoms, sand, at 3 cables from the shore. On the north coast of the bay there is a hill of some height with two remarkable peaks, which is a useful mark to vessels coming from the south.

Mansiol point is wooded, and can be distinguished by two islets near it to the E.N.E., both of which are surrounded by rocks. South of the point is a little bay, in which coasters can anchor in a depth of $5\frac{1}{2}$ fathoms.

Buyallao island, $1\frac{1}{4}$ miles in length N.N.W., and S.S.E., and narrow, is of regular height, densely wooded, and fringed with rocks on its north-west end to the distance of one cable; two sharp pointed rocks lie off its north-east side.

Buyallao point is of peaked rocks, covered with trees; with little hills in the interior by which it may be easily distinguished. Foul ground extends a quarter of a mile south-eastward from the point.

Soguikay bay has a steep beach on its northern side, where the depths are 7 to 18 fathoms at one cable from the shore; the western coast is bordered with rocks to the distance of about 3 cables. Small vessels can anchor in case of necessity inside Sognikay island.

Soguikay island is low and surrounded with a reef which extends about one-third of a mile from its north and south points; some detached rocks lie off the west side. In the passage between this island and the coast the depth is 15 fathoms.

Pandan point is round and of middling height; a reef advances $1\frac{1}{2}$ cables from it with the depths of $5\frac{1}{2}$ to 7 fathoms, rock, at its edge. A patch of 4 fathoms is charted at the distance of about 4 cables south-eastward of the point.

Tambaron isle, separated from Pandan peninsula by a channel nearly 3 cables wide, is steep-to; the passage appears clear, and has a depth of 8 fathoms.

Masin islet, lying close to the southward of Tambaron, is also steep-to except on the south side, which is fringed with reef. On the west side there is a small bay where coasters can anchor.

Bulalakao bay, about 2 miles wide, and running in for the same distance, affords shelter from all but southerly winds; it has a depth of 23 fathoms at the entrance, and 12 fathoms in the middle, decreasing to 4 fathoms, sand, near the sand beach at the head, where three small streams enter the bay near Bulalakao village. The east coast of the bay is covered with trees, and on that side there is a little cove named Laurigau, sheltered from all winds, with a depth of 13 to 16 fathoms, mud. No supplies can be obtained at Bulalakao.

The islets Alibatan, Silat, and Aslom, are surrounded with rocks. The passages formed between them, and with the coast of Mindoro, are clear and deep. There is limited anchorage suitable for coasters, between Aslom and the Mindoro coast.

Burankan point is free from danger, and can be passed close-to. Pandarochan bay has been already described; see page 76.

The **SEMIRARA ISLANDS** form a group of eight islands lying off the south end of Mindoro, which extend to a distance of about 25 miles from Burankan point; they are all surrounded by reefs.

Semirara, $8\frac{1}{2}$ miles in length, and the largest of the group is hilly, reaching an elevation of about 512 feet at the highest part. On the west coast there are several small bays which are almost entirely obstructed by reefs, on the edge of which are depths of 5 to 10 fathoms. Off the town of Semirara, which stands on the top of a hill facing the largest bay, the anchorage is very bad even for coasters; at this part the shore reef extends to a distance of $1\frac{1}{2}$ miles. The east coast is bordered by a reef which projects about a mile from the north-east part of the island; on coming from the north this side of the island must not be approached within 3 miles until the town of Semirara bears West. There is anchorage off the south end of the island in a depth of 5 to 8 fathoms, sand, during the N.E. monsoon. Good coal for steaming purposes has been found on the island.

Libagao island, less than a mile in extent, is 410 feet in height at its northern part; it is surrounded by reef the limit of which has not been clearly defined, and should not therefore be closely approached.

Nagubat is very small and flat; at one mile to the eastward there is a shoal of $4\frac{1}{2}$ fathoms which appears to be united with the island. The channel between Nagubat and Libagao is deep, as is also the passage between Nagubat and Semirara.

Kaluya is 623 feet high at the south part; there is a bay on the west side of the island with a low shore and sandy beach, on the north-east part of which there is anchorage in a depth of $5\frac{1}{2}$ fathoms with the north point of the bay bearing N.N.W. $\frac{1}{2}$ W. and the south point S. $\frac{1}{2}$ W.

Sibaton, 111 feet in height, is separated from Kaluya, but apparently stands upon the same reef with no practicable channel between. The reef which surrounds Sibaton extends 2 miles south-eastward from its north point.

Sibolon, 148 feet in height, is fringed with reef and is unsafe to approach.

Sibay is 213 feet high; its north-west point rises to a peak and is clean; its north coast can be passed at the distance of half a mile, but the west side should not be approached.

Panagatan reef has already been described in Chap. II.; see page 77.

ISLANDS EAST OF MINDORO. — **Maestre de Campo island**, lying S.E. 12 miles from the south-east shore of the lofty promontory formed by mount Dumali in Mindoro is of circular form, $3\frac{1}{2}$ miles in diameter, high, mountainous and thickly wooded; it has very steep shores, only affording anchorage to small craft. The summit of Maestre de Campo, when seen from the eastward appears like a ridge with three distinct hillocks; it is estimated to be 700 feet in height.

Port Concepcion, on the south-east side of Maestre de Campo, is the principal anchorage; it is easy of access, $5\frac{1}{2}$ cables in width at the mouth between San Martin and Fernandez points, and of the same extent N.N.W. A tongue of land projecting 4 cables S.S.E. from the head of the port divides it into two bays; in the westernmost of these there is anchorage for small vessels in a depth of 8 to 10 fathoms, sand and mud, in front of the town of Concepcion. The interior of the port is lined by a rocky steep reef.

Dos Hermanas are two flat islets of rock, named Carlota and Isabel, 138 feet high, and separated by a deep channel $1\frac{1}{4}$ miles in width; the shores are clear and steep.

Banton island, 1,918 feet high, is peaked and rugged, and steep on all sides except the south-east, which is bordered by a narrow reef. It presents some shallow bays, and on the north-east part there is a village of some size, near which coasters find anchorage in 5 fathoms; they secure a hawser to the shore to prevent swinging. On the west coast there is good anchorage in the N.E. monsoon in a depth of 7 fathoms, sand, between the north-west point of the island and a small islet south of it. A good scope of chain should be given as the anchor is liable to slip off the steep bank.

Bantoneillo islet, 256 feet high, lies S.W. 3 miles from Banton. It is three-quarters of a mile long, north and south, and narrow; off its southern end is a pinnacle rock. The islet is very steep to at its north-west and south-east extremes.

See chart, No. 2,577 [2,656], and plan of port Concepcion, No. 949 [2,659].

Simara island, 870 feet high, is flat topped and well cultivated; it can be approached with safety. On the south side there is a village with a church and fort, but there is no anchorage off the island.

TABLAS ISLAND is mountainous, and on its north-eastern extremity is the peak Cabezo de Tablas, 2,405 feet in height; generally the coasts are clear and steep-to. Off the north end are two rocky islets, distant one cable from the shore; the larger islet is clear and steep, the smaller one has rocks round it, close to. On the west coast there are anchorages for small craft in the N.E. monsoon, and on that side is the sheltered port of Lug. From Bagulayan point, the south-west point of a wide bay on the west coast, a reef projects one mile to the northward; the chart shows 10 fathoms near its end.

Port Lug is the only sheltered anchorage on the west coast of Tablas during the S.W. monsoon. The port is about 4 miles in extent north and south, and from one to 2 miles east and west. The shores are steep-to and the depth of water from 10 to 20 fathoms, mud. The entrance points are more than a mile apart, but the channel is reduced to the width of half a mile by a reef that projects to a distance of 6 cables from the northern point. Within the mouth, in the approach to the anchorage there is a rocky shoal 4 cables in length north-east and south-west, and 2 cables wide; it is steep-to, with depths of 5 to 9 fathoms on the south side. The town of Lug, of 500 inhabitants, is on the north shore.

Anchorage.—During the N.E. monsoon, vessels can anchor on the north side of the harbour, before the town, in a depth of 9 fathoms; and during the S.W. monsoon, at the south end of it, distant 3 or 4 cables from the shore in 15 fathoms, mud, a berth being given to a long narrow projection of reef that juts out from the south-west part of the deep southern bight.

In entering port Lug, the southern point of the entrance should be made for, and sailing vessels, working in, should be coned by sight.

Water.—Near the western side of the town of Lug, there is a river of good water into which boats of light draught can enter.

Kabalian point, the south point of Tablas island, ends in a sand beach, with a depth of 11 fathoms at the edge, and a greater depth than 100 fathoms at a short distance.

LIGHT.—A *fixed white* light is exhibited on Kabalian point.

Kalaton point, on the south-east coast, is formed by a high bluff, which advances $1\frac{1}{2}$ miles from the coast, with depths of 5 to 12 fathoms alongside it; the chart shows a shoal lying about three-quarters of a mile E.S.E. from the point. In the bay, formed by the point, and the islet

See chart, No. 2,577 [2,656], and plan of port Lug, No. 972 [2,660].

Kabahan to the southward, there is anchorage in a depth of $5\frac{1}{2}$ to 11 fathoms, with Kalaton point bearing N.E.

Shoal.—At 5 miles north of Kalaton point and $2\frac{1}{2}$ miles from the coast, near the town of Lanan, there is a bank of sand and rock $1\frac{1}{2}$ miles in diameter, with $5\frac{1}{2}$ fathoms on the shallowest part, and a depth exceeding 100 fathoms near its eastern edge.

Tamboloton bay is the name of the wide bay southward of the Cabezo or north-east point of Tablas; in this bay vessels can find shelter in the S.W. monsoon, but the water is very deep. There is a depth of 8 fathoms very near the coast, bottom fine sand, with the western entrance to port Romblon, bearing E. by S.; the shore is steep, bordered by rocks very close to it. From the southern part of the bay, 4 miles from the north-east point, a ledge of rocks juts out to a distance of three-quarters of a mile.

The channel between the north-east point of Tablas and the islands Romblon and Cobrador, is $3\frac{1}{2}$ miles wide and free from danger. It is the route usually taken from Verde island passage to Jintotolo channel.

Romblon and the islands to the eastward are described in the next chapter.

Karabao island is hilly, and rises to a peak 686 feet in height. Its coast is clear and steep, the rocks that fringe the shore lying very close in; on the east side there is a sand beach off which vessels can anchor in a depth of 5 fathoms.

The channel between Karabao and Burakay is clear, but the tidal streams are very strong. The flood sets eastward and the ebb westward.

Burakay island lies one mile to the northward and westward of Tabun point in Panay, and extends 4 miles N.N.W.; the summit is 436 feet in height. On the west side there is a depth of $5\frac{1}{2}$ fathoms, where anchorage can be had if required. The channel between Burakay and Tabun point is clear, but there are rocks on both sides of it, and the tide-streams rush through the passage with great force.

PANAY ISLAND is situated 27 miles to the south-east of Mindoro, and has an area of 4,708 square miles. It is of an irregular quadrangular shape with three projecting angles, that at the south-east being rounded off; but here the island of Guimará, separated by a very narrow strait, appears to have once formed another projection. A chain of mountains runs in a curved line from the north-western to the southern promontory, and from the centre of this, another chain branches off to the north-eastern promontory, thus dividing the island into three natural districts, which form the provinces of Antiki, Kapiz, and Iloilo.

Panay is exceedingly fertile, being well irrigated by numerous mountain streams; and it supports a large population of Bisayas, with a few Negrits

in the mountains. It produces rice in abundance, sugar, cotton, coffee, tobacco, pepper, and cacao. Ebony and sapan-wood are obtained from the forests, while pearl shells, tortoise-shell, and trepang are found on its coasts. It is, after Luzon, the most densely peopled and highly cultivated island of the group, having about 735,000 inhabitants. It has three large towns—San José de Buenavista, Kapiz, and Iloilo, the latter a free port, and a place of very large trade—and seventy-four villages.

Tabun point, the northernmost extreme of Panay, is flat and sandy, with a few trees over it; to the east of the point, and at less than a mile from it there are detached, sharp-pointed rocks.

WEST COAST of PANAY.—The promontory rising to an elevation of 1,857 feet above the sea, and forming the north-west extremity of the island of Panay, terminates in this part in a clear and steep coast, the most salient points of which are those of Nasog and Pucio.

Nasog point, the north-west extreme of the island, is a wooded bluff 718 feet high, and steep-to; on its northern side there is good anchorage in a depth of 5 fathoms, sand, before the village and river Malay.

Pucio point, 8 miles S. by W. $\frac{1}{2}$ W. of Nasog point, to which it is similar, is 620 feet high, and girt with rocks which project to some distance.

The anchorage of Buruanga is between the above points in a small bay, with a depth of $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms before a beach, near the mouth of a little river. Between Buruanga and Pucio point, the coast is fringed with detached rocks, the largest of which are clear, but the lesser ones throw out reefs to the distance of half a mile; behind these rocks the coast presents high rocky cliffs with cascades falling over them.

The coast from Pucio point to Pandan is clear with deep water near it, and is bordered in general with sand beaches. Two lines of hills run parallel to the coast; their slopes are cultivated and dotted with churches.

Pandan bay is clear of danger and deep, and there is good anchorage off the town during the N.E. monsoon in a depth of from 7 to 10 fathoms. The town of Pandan, containing 9,400 inhabitants, is in the bend of the coast; two miles westward of it the little river Bugang enters the sea.

Shoal.—A bank with $1\frac{1}{2}$ fathoms on it lies $1\frac{1}{2}$ miles W. by N. $\frac{1}{4}$ N. from the village Alipayao, 8 miles southward of Pandan.

Maniguin island, 13 miles to the south-west of Pucio point, is small, rising to an elevation of 150 feet in the centre; it is fringed with a narrow, steep, reef. On the south-west side is a village enclosed by a strong palisading.

Batbatan isle, situated 17 miles S. by E. $\frac{1}{2}$ E. from Pucio point, and $8\frac{1}{2}$ miles West of Lipata point, is about 450 feet in height, with a central hill; on the north and north-east sides there is a reef extending out about half a mile, but otherwise it is steep-to.

Carmen bank, situated approximately in lat. $11^{\circ} 23\frac{1}{2}'$ N., long. $121^{\circ} 38'$ E., and lying 12 miles S. $\frac{1}{2}$ W. from Maniguin island, with the summit of Batbatan bearing E. by N. $\frac{3}{4}$ N., is about 2 miles in extent with an ascertained depth near its centre of $5\frac{1}{2}$ fathoms, but there may be less water.

Seco bank.—The islet upon this bank bears S.W. by W. $\frac{1}{4}$ W. 15 miles from Batbatan, and S.E. by S. nearly 3 miles from Carmen bank. The dry part of Seco bank, of white sand, is less than one cable in extent, and about 6 feet high; at low water rocks dry out 3 cables from the sand. Breakers extend some distance northward of the islet; the depths at three-quarters of a mile from it are from 25 to 70 fathoms.

Sultan bank has already been described in Chap. II.; see p. 86.

Lipata point, formed by a tongue of land that advances one mile to the westward, is surrounded by a narrow reef which extends half a mile north-eastward; there is anchorage to the north of it in uneven depths, from $5\frac{1}{2}$ to 23 fathoms, which is the only anchorage on the west coast of Panay during the S.W. monsoon.

Maralizon islet, lying $3\frac{1}{2}$ miles S.W. by S. of Lipata point, and 2 miles off the coast, is of moderate height; a reef projects one mile from it to the eastward and half a mile to the westward. On the coast, facing the islet, is the town of Kolasi, containing 10,800 inhabitants.

Shoals.—In front of the town of Tibiao (population 5,800), between Kolasi and Nalupa, there is a bank with a depth of 6 fathoms on it, lying at the distance of $1\frac{1}{2}$ miles from the shore. Before the town of Nalupa (population 5,000) there are rocks awash; and a coral bank with $1\frac{1}{2}$ fathoms least water on it, lies $2\frac{1}{2}$ miles W. by N. from the town.

The coast from Nalupa to Dalipé point consists of sand beaches forming slight indentations, and is cut into by several rivulets. Several small towns are on the shore. The river Sibalon, 5 miles north of Dalipé point, has two mouths; both have bars on which there is less than one fathom water. At a mile south of the river is the town of San Pedro, with a population of 6,400.

Shoals.—A sunken rock, marked on chart P. D. with less than 6 feet, is reported by fishermen to lie about $1\frac{1}{2}$ miles from the shore, abreast of the river Palma, north of Bugason.

There is a bank with a depth of 10 fathoms situated about 3 miles West from the mouth of Sibalon river.

Dalipé point is low, and fringed with a narrow strip of rock.

To the southward of Dalipé point there is a sandy bay lined with rocks, having on its northern extremity the town of San José de Buenavista, the capital of the province, with a population of 5,200, and at its southern end the town of Antiki, of about 7,600 inhabitants. Provisions can be procured at both these places, as also wood and water.

A coral reef, 20 yards in diameter, and with a depth over it of 17 feet at low water, is reported to lie three-quarters of a mile southward of the south extreme of the point on which the town of San José is situated. There is a depth of 7 fathoms inside, and of 9 fathoms outside, the reef.

The anchorage is to the southward of the town of San José, and near it, in a depth of 6 to 7 fathoms, sand, well sheltered during the N.E. monsoon. The river Malandog enters the bay about 2 miles south-eastward of the town; the depth in the river is $1\frac{1}{2}$ fathoms. There is an active coasting trade between San José and Iloilo, distant 70 miles.

The coast from Antiki to Anini point is very steep, and bordered by a sand beach. A number of small streams cut through the shore, and there are several towns along it, the principal one of which is Dao, containing 7,000 inhabitants.

NASO POINT, the wide south-west extremity of Panay, is formed by the termination of the coast range; it is clean and steep-to, and is fronted by the islet Nogas off its south-west point, and the islet Jurao-jurao, 3 miles to the eastward of Nogas. There is a conspicuous white church with a dome-topped tower on the point.

Nogas island lies off the point and village of Anini; it is surrounded by a reef, and forms with Anini point a narrow channel suitable for small craft. In the middle of the western entrance there is a reef a quarter of a cable in diameter, with a depth of $2\frac{1}{2}$ fathoms on it. Gunboats can anchor east of Anini during the N.E. monsoon in depths of from $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms, sand. It is not advisable to anchor between Nogas and Jurao-jurao, as the bottom is rocky.

THE SOUTH COAST OF PANAY trends north-east for $15\frac{1}{2}$ miles to Talisaya point, near San Joaquin, and this part of the coast is high, clean, and steep-to; from that point it trends E.N.E. for a distance of 22 miles to the town of Oton, and is low, but free of danger till near Oton bank. From Oton to Iloilo, $5\frac{1}{2}$ miles, the shore continues low and clothed with mangroves. The bights along the coast have deep water, and a vessel can work close in shore, or from point to point with safety; the wind scarcely ever blows on to the land, but there is no good anchorage, the coast being steep and the holding ground indifferent.

Oton bank is a bank of soft muddy sand, which commences about $2\frac{1}{2}$ cables S.W. by W. from the fort of Iloilo, and stretches for $5\frac{1}{2}$ miles to

See chart, No. 2,578 [2,648].

the W.S.W. with a depth of from 3 to 7 feet for nearly the whole of this distance; hence it continues S.W. for 3 miles, and then turns abruptly back to the eastward for about 3 miles towards Kabalik point, when it bends in a N.E. direction for a further distance of 2 miles. The ridge in the middle part of the bank is reported to dry at low water, and to be shoaling and extending; the depth on the southern portion of the bank ranges from $1\frac{1}{2}$ to 3 fathoms. These banks are said to vary in depth and configuration with the monsoons. The western limit of 5 fathoms is shown on the chart to lie S. 24° W. of the town of Oton, and the southern limit to be S. 78° W. of the rugged point, 150 feet high, one mile S.S.W. of Kabalik point.

Oton bank is composed of shifting sand, and vessels should not attempt to cross it. The northern channel between Oton bank and the coast of Panay, which formerly had at its eastern end a depth of $3\frac{1}{4}$ to 4 fathoms, has shoaled considerably, and pilots have declined, since 1878, to take vessels drawing even less than 13 feet through it.

Buoys.—Two buoys mark Oton bank, a red buoy on the south-western limit, and one painted black on its south-eastern edge about 4 cables northward of Kabalik point, with Bondulan point in line with the east side of Iloilo fort. These buoys cannot be depended on, and their colour may have been changed.

A large red buoy has been established (April 1901) on the southern end of the shoal lying south-westward of Bondulan point, which should be left to the eastward by passing vessels. The buoy lies with Iloilo fort about in line with Bondulan point bearing N. 39° E., Oton dome N. 52° W., and Molo dome (white-topped and near the twin church spires) N. 2° E.

Directions.—After rounding Naso point steer E.N.E. for Santa Ana on the coast of Guimarás, and as the coast is bold stand in until Bondulan point is nearly in line with Kabalik point N.E. by N.; then steer towards Bondulan point, passing about 2 cables from Kabalik point and preserving that distance from the Guimarás shore, until about one mile beyond Kabalik, when steer North and open Dapdap point clear from Bondulan point, passing close westward of the buoy marking the shoal ground extending south-westward from the latter point. A long, low, conspicuous white building situated a little to the westward of the fort should now be steered for until Dapdap point comes in line with Fort point, which line preserved will lead clear of Bondulan point, when a course may be steered for the anchorage off the river, passing about 4 cables from the fort, and clear of the $4\frac{1}{4}$ -fathoms shoal lying off it.

Approaching Iloilo from the southward, Oton church, a large white-domed building on the sea coast, is a very conspicuous object. The pilots

See plan of port Iloilo, No. 2,391 [2,649].

reside on Guimarás island, and come off on a vessel approaching Kabalik point.

GUIMARÁS ISLAND, in front of Iloilo, is 23 miles in length, N.N.E. and S.S.W., and $10\frac{1}{2}$ miles wide, and forms with Panay island the strait of Iloilo. It is high and hilly, especially on the eastern side, where the hills Jaljat, Pandan, and Akdan rise; in clear weather these hills can be seen from Sojoton point on the west coast of Negros. The south-east coast is bordered by a number of islets, which renders the navigation very difficult. The island is fertile, and contains about 6,000 inhabitants.

Kabugao point, at $1\frac{1}{3}$ miles from the mouth of the river Dumangas in Panay, forming the north end of the island, is rounded, and has detached rocks off it. From the point the coast trends about south-west for $7\frac{1}{2}$ miles, forming capes and bays up to Bondulan point, opposite Iloilo, which is high and steep. A bank of $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms depth stretches out 3 cables off the town of Tilat or Buena Vista.

Bondulan point.—From Bondulan point, 417 feet in height, a bank of from $1\frac{1}{2}$ to 3 fathoms extends south-westward for $1\frac{1}{2}$ miles. Bondulan point, in line with Iloilo fort, clears this bank, which is marked at the south-west end by a red buoy, moored in a depth of 5 fathoms.

Kabalik point, which is clean and bold, lies $3\frac{1}{2}$ miles S.W. by S. of Bondulan point; this point should be passed close-to in taking the channel south of Oton bank, which is here $3\frac{1}{2}$ cables wide, but looking from the westward Kabalik is not easily distinguished, being no higher than the rest of the coast, and, in fact, is not so conspicuous as the point 150 feet high without a name, situated one mile S.W. by S. of it, and which is also clean and steep-to. From the south, or when off Santa Ana, Kalabik point is, however, easily recognised. From this point the coast curves southward for $4\frac{1}{2}$ miles to port Santa Ana, and is bold, with several little islets close to it.

Naburul islet, lying close to the shore 3 miles southward of Kabalik point, appears from the westward as a high, dark bluff; it is steep-to, and useful as a mark to vessels making the southern entrance of Iloilo strait.

Port Santa Ana is a small harbour, clear and deep, open to the west and easy to make; the entrance is half-a-mile wide. Inside, to the northward, is a point, with an islet to the westward of it, and a rock awash at low water two-thirds of a cable south-west of the islet. The plan shows shoal ground with a depth of one fathom extending one cable south from the point, and a rocky head off the eastern shore at the

See chart, No. 2,578 [2,648], and plan of port Santa Ana, No. 2,349 [2,649].

distance of $2\frac{1}{4}$ cables. The anchorage is in the middle of the port in a depth of 6 fathoms. Water can be obtained from a rivulet at the bottom of the port.

Tides.—It is high water, full and change, at port Santa Ana, at 12 hours; springs rise $5\frac{1}{2}$ feet.

Igan bay, immediately south of Santa Ana, is clear, with a depth of 11 to 13 fathoms in the middle, and $2\frac{1}{2}$ to $5\frac{1}{2}$ fathoms at the edge of the bank that borders the shore.

LIGHT.—On the western extreme of the south-west end of Guimarás island a *group-flashing* light is exhibited, at an elevation of 111 feet above the sea, showing *three white flashes* in quick succession, followed by a *red flash*, the whole period being fifteen seconds. The light is visible in clear weather from a distance of 16 miles, between the bearings S. 9° W., through east and north, and N. 26° W.

The lighthouse, 58 feet high, is of iron, cylindrical in shape, and painted white and grey.

Lusaran point, the south-west extremity of Guimarás, is bold to the south and east, but to the north-west there are several rocks, and an islet surrounded by reefs, and at $2\frac{1}{2}$ miles N. 60° W. of the point there is a rocky shoal.

The south-east coast of Guimarás is foul, and skirted by islets and rocks which form narrow channels that can only be navigated by experienced pilots.

GUIMARÁS STRAIT, between this island and Negros, is 6 miles wide, but the passage is reduced to $1\frac{1}{2}$ miles by the islets and banks at the southern entrance. Inampulugan island is the most remarkable in the strait; between this island and Guimarás there are six steep rocks with flat summits, on some of which are trees; a small shoal (Piedra Rosario) with very little water over it, lies about $1\frac{1}{2}$ miles to the southward of Inampulugan island. Northward of Inampulugan are two little isles connected with it by a bank having $1\frac{3}{4}$ fathoms water on it which extends south-eastward from them; between this bank and the reef off Pandan (on the coast of Negros), is a channel $1\frac{1}{2}$ miles wide with a depth of $4\frac{1}{2}$ to 8 fathoms. This is the least dangerous passage to use, but care must be taken to avoid a shoal of 3 fathoms lying one mile west of Pandan point, and a bank not sounded out, shown on the chart between Pandan and the islet of Nadulao; as also a bank of sand with $1\frac{1}{2}$ fathoms over it, 4 miles in extent, which lies 3 miles S.E. to S.S.E. of Inampulugan.

The east coast of Guimarás is clear, and a depth of $5\frac{1}{2}$ fathoms will be found at a distance of one mile from it.

Unisan islets are a group of rocks that lie about 8 miles S.E. of Lusaran point; they are surrounded by reefs, and at one mile north-west of them is a little rocky patch; the islets and the patch occupy an extent of $2\frac{1}{2}$ miles. The depths in the neighbourhood are $6\frac{1}{2}$ to 8 fathoms to the northward, 20 fathoms at less than a mile to the eastward, and 4 to $6\frac{1}{2}$ fathoms in the channel between them and the islet Guianon.

ILOILO.—The town of Iloilo stands on a low sandy flat on the right bank of a river; at the end of this flat is a spit on which a fort is built, and close to which there is deep water. Vessels of 15 feet draught can ascend the river a short distance, and lie alongside wharves which communicate with the merchant houses; but large vessels must anchor outside near the spit. It is a place of great commercial importance, and a brisk coasting trade is normally carried on from it. The principal edifices of the town were reduced to ruins in February 1899 by the Filipinos, who fired the place, using petroleum, since which time trade has been in a very unsettled state.

The population of Iloilo is about 13,000; that of Molo, which adjoins it, is about 1,600, and Jaro, which is at a distance of 2 miles from Molo, and is the chief market town, is larger.

LIGHTS.—From a structure attached to the keeper's dwelling on the southern side of the entrance of the river Iloilo, a *fired red* light is exhibited at an elevation of 25 feet above high water, which can be seen in clear weather at a distance of 6 miles. The light is visible from S. 10° E., through west, to N. 25° E., and from N. 34° E. to N. 49° E.; it is obscured elsewhere.

A *red* light is shown from an obstruction in the centre of the channel at the mouth of the Iloilo river.

Shoal.—Buoy.—A shoal of small extent and with a depth of $4\frac{3}{4}$ fathoms over it, lies situated $3\frac{1}{4}$ cables East from the fort at Iloilo, with the red light at the river entrance bearing N. 35° W. The shoal is marked by a conical buoy, painted in black and white vertical stripes.

Trade.—The chief imports are coal, rice, petroleum, piece goods, and general merchandise, but most sailing ships arrive in ballast.

The exports are sugar, tobacco, cigars, copra, sapan wood, hides, and hemp; it is also the principal place of manufacture of pinn, jusé, and sinamoya, a tissue greatly in use amongst the Philippines. The place occasionally suffers from a visitation of locusts.

In the year 1900, 74 vessels, with a total of 95,194 tons, entered the port, and 77 vessels, of 99,550 registered tons, cleared, 73 being steamers; while of the total, 45 carried the British flag with a tonnage of 63,782 tons. At present the trade is very unsettled in consequence of the war.

See chart, No. 2,578 [2,648], and plan No. 2,391 [2,649].

Supplies.—Provisions of all kinds are plentiful, and can be obtained at reasonable prices; in 1894 beef was about $5\frac{1}{4}d.$ per pound, vegetables $2d.$, and bread $3\frac{1}{2}d.$ Water is scarce, and is brought across from Guimarás in tank boats; it is supplied to the shipping at the rate of 2 dollars per tun; the Europeans depend mainly upon rain water.

There are no means for effecting repairs; marine stores are not procurable.

Coal.—There is a variable quantity of coal in store, generally under 500 tons, chiefly Japanese; it is kept for the supply of local steamers that take it in alongside the wharves. Vessels in the roads can have it brought off in bulk in lighters at a cost of 50 cents a ton; coolies can be hired at 75 cents per ton, but they will not coal vessels if they can get other work. Coaling is slow unless previous notice is given; 100 tons is the quantity shipped in an ordinary day's work. The price of coal in 1894 was $27s. 3d.$ per ton. In consequence of the war no less than 15,706 tons of coal were imported in 1899; in 1900 the amount was 4,958 tons; Australian, 4,508 tons; and Japan, 450 tons.

Time signal.—See page 29.

Pilots.—There are 9 pilots for Iloilo. The outer pilot station is south of Kabalik point.

Tugs are generally procurable, and sailing vessels are usually towed out past the Oton bank.

Telegraph.—A submarine telegraph cable connects Iloilo with Manila; there is also a cable between Iloilo and Sebu, &c.; see page 50.

Mails.—There is regular weekly communication with Manila, which is distant 250 miles; the steamers generally arrive on Monday, and leave on the same or the following day. There are, besides casual steam-vessels, and other small steamers carrying on the local trade to Antiki and Negros; but most of the small coasting traffic is conducted in schooners.

River Iloilo.—From the town to the sea the river makes two sharp bends, and, flowing with great force to the eastward, forms (between two banks consisting of its own deposits) an entrance channel, running north-west and south-east, two-thirds of a cable in width, and with $1\frac{1}{2}$ fathoms depth at low water. The mouth of this channel is obstructed by a lighter and mud scows sunk in the centre of the channel, and forming a compact group about 20 yards in width, but leaving a passage on either hand. A nun buoy, painted reds, marks the spot; at night a red light is shown, as previously stated. The southern shore is the deepest, as the bank projects from the north side; within the bar the channel widens and the depth increases to 16 and 22 feet.

Anchorage.—The best anchorage for vessel drawing under 13 feet is within the river, off the wooden jetty near the warehouses. Vessels above 13 feet draught must anchor outside; there the anchorage recommended is off the entrance of the river, with the lighthouse bearing West. Small vessels may find shelter during the N.E. monsoon south-westward of the fort in a depth of 4 fathoms. During strong south-west winds a heavy sea sets in which prevents landing.

Typhoons do not occur here regularly, but in most years the tail of one passes over the place.

Abreast of the fort the eddies are strong and irregular on the flood; it is necessary to moor.

Tides.—It is high water, full and change, at Iloilo, at 12 hours; springs rise $5\frac{1}{2}$ feet. The tidal streams reach a strength of 3 knots an hour, and they turn at high and low water by the shore.

Directions.—Approaching from the south-westward; see page 241.

The approach to Iloilo from the northward and eastward is described at the end of the next chapter; see page 270.

See plan, No. 2,391 [2,649].

CHAPTER VI.

VERDE ISLAND PASSAGE TO ILOILO, EASTERN ROUTE ; ROMBLON, SIBUYAN AND MASBATE ISLANDS, NORTH AND EAST COASTS OF PANAY.

Variation $0^{\circ} 50'$ East in 1902.

During the S.W. monsoon the eastern route to Iloilo is generally taken, thus:—The Verde island passage is followed as far as Dumali point, and then the route lies east of Maestre de Campo, south of Simara, between Tablas and Romblon; thence to pass 2 miles south of Jintotolo island, and from there down the east coast of Panay to Iloilo.

The islands Maestre de Campo, Hermanas, Simara, and Tablas have been described in the last chapter; it is now intended to describe the islands Romblon, Sibuyan, Masbate west and south coasts, and the islands to the southward of Masbate. Then a description of the north and east coasts of Panay with the adjacent islands will be given, followed by that of the eastern part of Iloilo strait.

The channels.—Between Tablas and Simara the channel is $6\frac{1}{2}$ miles in width, and between the north-east point of Tablas and the islands Cobrador and Romblon 3 miles wide; both are free from danger. The flood stream sets to the east between Tablas and Simara, and to the south between Tablas and Romblon. The north coast of Tablas is clear and steep-to; the track passes nearly 2 miles outside the islets off the north point mentioned in the last chapter (p. 236).

ROMBLON ISLAND, 6 miles eastward of the north-east point of Tablas, is hilly, and is composed chiefly of quartz, marble and slate; it is $8\frac{1}{2}$ miles in length, north and south, and $4\frac{1}{2}$ miles wide. Off its north-west part are the islands Cobrador, Alad, and Lugbung; the last of which lies in front of the small but sheltered port of Romblon.

Romblon contains a total population of about 38,000.

Cobrador, situated 3 miles north-west of the northern end of Romblon, is clear and steep-to, except on the south-west part, which is bordered by a reef to the distance of 2 cables.

See chart, No. 2,577 [2,656].

Alad, three-quarters of a mile from the north-west coast of Romblon, is about $1\frac{3}{4}$ miles in length east and west, and $1\frac{1}{4}$ miles wide; it is high, clear, and steep-to. About $2\frac{1}{2}$ cables south of its southern point (Bombon) is the islet Tinang, joined to it by a rocky reef.

Lugbung island is $1\frac{1}{2}$ miles long N.N.E. $\frac{3}{4}$ E. and, S.S.W. $\frac{3}{4}$ W., narrow in the middle, but wider at each end, on which are two hills. From the northern point rocks extend one cable, and from the south-west point 2 cables.

The passages formed by Alad and Lugbung islands with Romblon, are of great depth with rocky bottom; the widest and best is the northern passage between Alad and Romblon; it is 8 cables in width, and the shores on both sides of it are said to be clear and steep.

Currents.—The currents in these channels are strong, and care must be taken to keep in mid-channel; the flood tide sets to the south, and the ebb to the north.

PORT ROMBLON, between points Sabang and Rosas, is separated into two parts by Agbatan point. All these three points send out reefs which, under favourable conditions of sunlight, may be easily distinguished by the whitish appearance of the water; that from Sabang projects 4 cables in a S.W. by S. direction; that from Agbatan 2 cables to the west, and that from Rosas and Binagon, the next point further in, to about a cable to the northward. Stakes are placed from time to time to mark the reefs, but they disappear with the first heavy blow.

Anchorage.—The northern port is $5\frac{1}{2}$ cables in width between Sabang and Agbatan points, but only 2 cables wide between the reefs that line the interior; the depth off these reefs is about 16 fathoms, the depth of the middle of the bay is not indicated; the entrance between the extremities of the reefs projecting from the above points is $2\frac{1}{2}$ cables wide and 27 fathoms deep. The anchorage in the southern port is only $1\frac{1}{2}$ cables wide, but is as sheltered as a basin; the depth near the sides is 5 to 15 fathoms, that in the middle is not indicated. On the hillside about 2 cables N.E. of the landing place at Romblon, and at a short distance back from the shore, there is a conspicuous limestone rock, at an elevation of about 150 feet; this mark kept on the bearing E.S.E. leads to the anchorage off Romblon. The town of Romblon is near the beach at the bottom of the port and carries on a trade in cocoanut oil. It contains a population of about 18,400.

Supplies.—Cattle are plentiful; and excellent water can be obtained coming from the hills which surround the port.

Coast.—From the little islet, Bangud, $1\frac{1}{2}$ miles from the south-west point of port Romblon, the coast runs $2\frac{1}{2}$ miles to the southward, forming three bays; the first two are foul, but in the last and most southern one

which is one mile wide and half a mile deep, there is anchorage in a depth of from 6 to 10 fathoms at a distance of one cable from the shore.

From the southern point of this bay, San Pedro point, the coast trends to the S.S.E. for 2 miles, to the south-west point of the island, forming two bays; the northern of these is shallow, and appears to be foul; the southern bay has a depth of 5 fathoms at one cable from the beach, before a stockade of nipa.

From the south-west point of the island, round the south to the east, the shore is clear and very steep, with a depth of 50 fathoms near it. The east and north-east shores are clear, and like the whole coast of this island, can be approached to the distance of half a mile.

SIBUYAN ISLAND is mountainous, and rises in the centre to a peak 6,424 feet high, visible at the distance of 75 miles in clear weather; this peak is also named Sibuyan. The island is 17 miles in length north-west and south-east, and 9 miles wide. The north coast is bordered by rocks, and the north-east part is fringed by reefs to a distance of nearly 2 miles; but from the east point round to the southward, it is clear of all dangers, and presents sand beaches, off which there is good anchorage.

Coast.—Kadodiangan point is the western extremity of the island; from it the coast trends S.S.E. 3 miles to Bolabok point, and then south-east $8\frac{1}{2}$ miles to Kantingas point, forming a bend two miles deep, into which flow several streams, and the river España. This river, though it has a depth of 2 fathoms inside at low water has only $1\frac{1}{2}$ feet on the bar, which therefore can only be crossed at high water. The shore of this part of the coast is of coarse sand, and the depths are 4 to $6\frac{1}{2}$ fathoms at one or two cables from it, falling quickly to 50 fathoms and upwards at the distance of 2 miles.

Kantingas point is low; there are rocky patches north-west and south-east of it near the coast, covered by $1\frac{1}{2}$ to 3 fathoms water, with depths of 6 and 7 fathoms near; the Spanish chart shows soundings of $4\frac{1}{2}$ fathoms at one mile N.W. of Kantingas point, and three-quarters of a mile from the coast. Vessels of large draught should not approach the shore closely here.

Pagalad is a town of 500 inhabitants, situated in a beautiful valley between three hills; a reef of small extent lies in front of the town, and to the west of it is a sandy point, with a depth of 5 fathoms near the shore.

Kauit point, the south extreme of Sibuyan island, is a tongue of coarse sand, low and flat; on its western side, very near the shore, is a little ledge of rock with a depth of 4 fathoms at 2 cables from it. The

town of Kaut is situated on the tongue of sand; it contains a population of about 500, and is defended by a fort.

Anchorage.—Between the towns of Kaut and of Pagalad to the north-west there is anchorage in a depth of 6 fathoms, sand, sheltered from north-east winds.

Prueba bank, lying one mile south of Kaut point, extends 2 miles to the south, and is one mile wide at the northern end, where the depth is 3 feet which increases to 6 fathoms towards the southern part. The depths round its edge are from 11 to 16 fathoms, and in the channel between it and Kaut point, 20 to 25 fathoms.

Cresta de Gallo (Cock's Comb), islet and reef.—The islet, lying 6 miles S.E. $\frac{3}{4}$ S. from Kaut point, is low and partly covered with trees, but rises to several little peaks along the length of its outline, of three-quarters of a mile; it is conspicuous and forms an excellent mark. A ledge of sand and rock, which sometimes uncovers, projects half a mile from its north end.

The islet stands a mile within the north end of a reef, about one mile in width and extending $4\frac{1}{2}$ miles in a S.S.W. direction; from its 5-fathoms limit it falls abruptly into deep water.

The channel between Cresta de Gallo and Prueba bank, is 3 miles wide and clear of dangers.

Romero shoal, a detached patch of $4\frac{1}{2}$ fathoms or probably less water, sand and stones, 6 cables in extent, lies 2 miles S.E. of Cresta de Gallo; the channel between them is very deep. Another patch (Aubarede) also with a depth of $4\frac{1}{2}$ fathoms lies N.E. by N., $2\frac{1}{2}$ miles from the islet.

The other shoals between Sibuyan island and Masbate are described further on; see page 252.

East coast of Sibuyan.—From Kaut point, the coast to the northward and eastward for 7 miles to Kajidiokan point is sandy and clear with depths of 45 fathoms generally at a distance of half a mile.

Kajidiokan point is a salient point of sand in low land. The town of Kajidiokan is situated in a picturesque valley between the hills. It has a population of 6,500, occupied with agriculture and fishing. Cattle are cheap and plentiful, and water can be obtained from the river. There is anchorage before the town during the S.W. monsoon.

Kambulayan point, the eastern point of the island, rocky and wooded, is steep with a flat crown of inconsiderable height. The depths off it are 4 fathoms at a distance of 2 cables, and, as on all the south-east part of the coast, the 100-fathoms contour-line lies distant less than a mile. The river Kambulayan, southward of the point, has half a fathom on the

bar, and deeper water inside, where there are fine tracts of level cultivated ground.

N.E. reef of Sibuyan is a dangerous reef of sand and rock, which extends from Kambulayan point to Konloai point, 7 miles to the north-west. It is separated from the coast by a channel half a mile in width, and with depths of from 12 to 27 fathoms; the shore is covered by mangroves and fringed by rocks.

The reef is half a mile wide, and has a general depth of about 4 feet with many rocks that uncover at low water, deepening at its ends to 5 fathoms. There is a gap in the middle of the reef, opposite the town of Lubug, and deep water close to its outer edge.

Konloai point is low, covered with mangroves, and fringed with reef which extends out half a mile, and has 6 fathoms on its edge.

Off Konsumala point, 5 miles westward, the coast reef extends out one mile, with depths of $4\frac{1}{2}$ to 9 fathoms on its edge.

Shoals.—A rocky shoal, with a depth of 3 feet and 2 cables in extent, lies $1\frac{1}{2}$ miles W.N.W. of Konsumala point. A short distance north-eastward there is another rocky shoal, 4 cables in extent, upon which the least depth known is 6 fathoms; this shoal, lying N.N.W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles from Konsumala point, has been but partially examined, and should be given a berth. Between the southernmost shoal and the town of Magallanes the depth is 12 fathoms.

Magallanes bay and town.—The bay is small and open between points Konsumala and Kangouak. The river Nailog flows into it, and on its left bank lies the town of Magallanes, of 11,000 inhabitants. On the bar of the river there is generally a depth of 2 feet, and within it of 8 feet; during the S.W. monsoon freshets from the river shift the bar, and increase the depth.

Anchorage can be had in depths of 3 to 9 fathoms in the corner formed by Kangouak point; care being taken to avoid a rocky ledge that projects from it to the eastward.

Coast.—From Kangouak point to Kadodangan point, the coast is steep-to, with a depth of 12 fathoms near the shore. Ipil point is of moderate height and remarkable by a little flat crown of red earth.

CHANNEL BETWEEN SIBUYAN and MASBATE.—This channel, about 30 miles in width, contains several dangers, which are situated on two lines stretching about north-east and south-west. They are all surrounded by deep water, and the lead gives no warning of their vicinity; but in daytime they can generally be seen at the distance of 2 miles.

The western line of these shoals is about 6 miles from the coast of Sibuyan, and contains the following :—

Cervera, the northernmost, is a bank 2 miles in extent, with a least depth of $1\frac{3}{4}$ fathoms ; from the shoalest part the S.E. peak of Sibuyan bears W. $\frac{1}{4}$ S., and Cresta de Gallo S.W. by S. One mile east of Cervera there is a very narrow bank, 4 cables in length north and south, with a sand bank on its centre, 5 feet above water ; this dry bank lies S. 79° E. of the vantay of Kajidiokan.

Perseus bank is half a mile in extent, and has on it a rock covered by 3 feet least water. From it the south-east peak of Sibuyan bears W. by N. $\frac{1}{2}$ N. and Cresta de Gallo S.W.

Roda, is a rocky shoal 6 cables in extent, and has a depth of $2\frac{3}{4}$ fathoms on its shallowest part. From it Kaut point bears W. $\frac{1}{2}$ N., and Cresta de Gallo S.W., distant $5\frac{1}{2}$ miles.

Aubarede, is a small shoal with a least depth of $4\frac{1}{2}$ fathoms, sand and rock. From it Kaut point bears N.W. by W. $\frac{1}{2}$ W., and Cresta de Gallo S.W. by S., distant $2\frac{1}{2}$ miles.

Cresta de Gallo has already been described, *see* page 250.

On the eastern line of shoals are the following :—

Bennet bank, is one mile in extent, having on its middle part a narrow bank of sand 10 feet above the sea, with some vegetation on it. From its centre, Gato island bears E. by N. $\frac{1}{2}$ N., and Kamasusu S.S.E. $\frac{3}{4}$ E. ; both these islands are on the coast of Masbate.

Montero shoal, 7 miles S.S.W. $\frac{1}{4}$ W. of Bennet bank, is 3 cables in extent, and has a rock on it covered by 3 feet water. From it Gato island bears N.E. $\frac{1}{4}$ E., and Kamasusu, S.E. by E.

LAS LLAGAS.—**Pineda shoal** is half a cable in extent and has $1\frac{1}{2}$ fathoms, least depth, on it. From the shoal Gato island bears N. 46° E., and Kamasusu S. 78° E.

Arana, 2 miles south-west of Pineda, is a dangerous rock half a mile in extent, with 3 feet least water over it, from which Kamasusu bears S. 88° E., and mount Sibuyan N. 57° W.

Reynoso bank, the southernmost, half a mile in extent, and with $3\frac{3}{4}$ fathoms least depth, lies about midway between Kaut point and Jintotolo point, Masbate, from which it is distant $18\frac{1}{2}$ miles. From the bank Kamasusu bears E. $\frac{5}{8}$ N., and S.E. peak N.W. $\frac{1}{4}$ W.

Roldan shoal, 4 miles W.N.W. of Pineda, is half a mile in extent, and covered by three-quarters of a fathom water ; from it Cresta de Gallo bears S. 74° W., and mount Sibuyan N. 64° W.

Carrasco bank, 2 miles south of Roldan, is half a mile in extent, and has $2\frac{3}{4}$ fathoms least depth; from it Cresta de Gallo bears W. $\frac{1}{2}$ S. and mount Sibuyan N.W. by W.

These five shoals are included within a dotted line on the chart under the general head of Las Llagas; there appears to be deep water around and between them.

Directions.—To proceed through this channel, a vessel should pass either between Sibuyan and the western line of shoals, or between Masbate and the eastern line. Both routes are easy and direct, even at night, when the land can be seen; but a good look out should be kept from aloft.

From the northward.—The N.E. reef of Sibuyan should be passed at a distance of 3 miles, and from a position 2 miles east of Kambulayan point a S. by W. $\frac{1}{2}$ W. course will lead between Prueba bank and Cresta de Gallo islet; when that little islet bears N.E. $\frac{1}{2}$ N., distant 5 miles, a course can be steered S.E. by E. to pass between Jintotolo island and the Zapatos.

If the channel near the coast of Masbate be taken.—When the island Gato bears east 3 miles, a S. by W. course for the island Zapato Mayor will lead clear of all dangers, until Jintotolo island bears east 4 miles.

From the southward these directions should be reversed.

Currents are not strong in the channel; the flood-tide, coming from the north, meets in mid-channel that coming from the south, and they counteract each other.

WEST COAST of MASBATE.—Bugui point, the northern extremity of Masbate, is very high, rugged, and steep-to, and can be passed close to in 7 or 8 fathoms. From it to Bagupantao point, 9 miles to the southward, the coast is high; the depths off it, at a little beyond the distance of one mile are from 10 to 15 fathoms. There is anchorage for coasters in a little bay south-east of Bagupantao point in a depth of $4\frac{1}{2}$ fathoms.

LIGHT.—From a conical tower 48 feet in height, situated near the extremity of Bugui point, at an elevation of 219 feet above high water, is exhibited a *group-flashing red and white* light, with a period of *thirty seconds*, showing one *red* and one *white* flash in each group. The light is visible when bearing from N. 7° W. through east and south to N. 74° W., at a distance of 22 miles in clear weather. (*Temporarily discontinued, October 1901.*)

Gato island, $2\frac{3}{4}$ miles W.S.W. of Bagupantao point, is a fine natural mark rising steeply from the water on all sides to a height of about 350 feet; between it and Majaba island on the coast the depth is 12 fathoms, and there is a clear, deep channel between it and Bennet bank.

Coast.—From Bagupantao point to Mariveles point, $14\frac{1}{2}$ miles to the southward the coast is somewhat lower, and forms bays of no importance, and of little depth of water, fronted by the islets Majaba, Nabugtut, Bagunbanua and Napayauan. Near these islets, on the outside, the depth is 6 fathoms, which increases seawards.

Tumalaytay islet, one mile west of the point of the same name, is small and wooded, and connected with the land by a strip of sand; the depth at half a mile outside it is 16 fathoms. Between this islet and Napayauan, $3\frac{1}{2}$ miles northward, a ledge of sand projects from the coast, but does not extend beyond the line of islands; there is a depth of 3 fathoms on its outer edge.

Shoal.—A small coral shoal, covered by $4\frac{1}{2}$ fathoms, with depths of 7 to 10 fathoms around, is charted W. $\frac{1}{2}$ N. $3\frac{1}{2}$ miles from Pagbulungan point, with Kamasusu island bearing S.E. Between the shoal and the coast the depth is 15 fathoms.

NIN BAY, lying southward of Pagbulungan point, with the islets Kamasusu and Karogo or Puro forming its south side, falls back north-eastward about 4 miles from its entrance which is 3 miles wide. The bay is well sheltered from all winds but those from S.S.W. to West, and the holding ground is good; the depth in the centre of the bay is 6 to 7 fathoms, lessening gradually towards its head. The small interior port of Mandaon, where small vessels can anchor in $1\frac{1}{2}$ to $3\frac{1}{2}$ fathoms, mud, lies on the eastern side of the bay, and is approached by a narrow channel after crossing a broad flat upon which the depth is 2 fathoms.

The little town of Mandaon is situated on the narrow peninsula that separates Nin bay from the inner port: it has few inhabitants and no resources.

Water can be obtained from a rivulet on the North shore.

Nin banks, are two shoals lying near the centre of the entrance to Nin bay; they are together about half a mile in extent E.N.E. and W.S.W., and 2 cables across, but are separated from each other by a depth of 9 fathoms. Romulus, the eastern bank, lies $1\frac{1}{4}$ miles S. by E. $\frac{1}{2}$ E. from Pagbulungan point, and has a general depth of $1\frac{1}{2}$ to 2 fathoms, rock; Argos, the western and smaller bank has a least depth of $4\frac{1}{2}$ fathoms. The entrance to the bay is between this bank and the northern shore which is clean and fairly steep to.

Ochoa, Sostoa and Ponte banks, are three detached banks each about 2 cables in extent, and with depths of from 3 feet to 2 fathoms, lying on the southern side of Nin bay between Nin banks and Karogo island; Ochoa the westernmost is situated N. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles from the peak of Kamasusu.

See chart, No. 2,577 [2,656], and plan of Nin bay, No. 977 [2,661].

A small patch of $3\frac{1}{2}$ fathoms lies N.E. by E. $\frac{1}{4}$ E. distant 4 cables from Ochoa bank.

Kamasusu islet at the south-western point of Nin bay, is about half a mile in length, and rises from all sides to a central peak 522 feet in height, which forms a good landmark.

Loog bay lies between Kamasusu and Karogo islands to the north, and the mainland of Masbate to the south; it is about 4 miles in length and from one to $1\frac{1}{2}$ miles wide, but is much narrowed by reefs projecting two-thirds of a mile from the southern shore, and by Tandas bank of 3 to 6 feet, extending nearly a mile northward from Talisay point. The depth at the entrance of Loog bay is 8 fathoms, decreasing to 5 fathoms when eastward of Kamasusu, and to less than 3 fathoms inside Kabug point.

The coast, from Nin bay to Jintotolo point, 13 miles S.S.W., is steep and clear, with depths of $3\frac{1}{2}$ to 7 fathoms at the distance of half a mile.

Jintotolo point is low and wooded; 2 miles S.E. by S. of it is Pulanauta point; both points are clear with depths of $4\frac{1}{2}$ to 7 fathoms at a short distance.

Anchorage.—To the eastward of Pulanauta point there is anchorage in a depth of $5\frac{1}{2}$ fathoms, sand, but care must be taken to avoid a patch of $5\frac{1}{2}$ fathoms that lies N. 76° E. of the point at the distance of one mile from the coast.

JINTOTOLO ISLAND, $2\frac{1}{2}$ miles S.S.W. of Pulanauta point, is 2 miles long north and south, and $1\frac{1}{2}$ miles wide; it is 120 feet high, well wooded, with a beach of sand, and is surrounded by a reef which extends 4 cables on its east and west sides. The channel that separates it from Pulanauta point is clear, with a depth of 14 fathoms in the middle.

Landmark.—On the highest part of Jintotolo island, towards the southern end, there is a high rectangular stone tower, which shows before the island itself is visible; there are other buildings near the tower. This tower, having the appearance of a lighthouse, is a conspicuous landmark that can be seen from any direction.

Circe bank, lying 7 miles E. by S. of Pulanauta point, has a depth of $3\frac{1}{4}$ fathoms on it; it is 6 cables in extent, north and south, and is steep on its southern side.

SOUTH COAST of MASBATE.—Asid gulf, which forms the south coast of Masbate, is included between points Pulanauta to the west and Buri, distant 33 miles to the east, and is 17 miles deep to the northward. The western shore is clear, but the northern and eastern part is filled by islets and shoals.

Naguran islet, in the centre of the northern part of the gulf, is small, and surrounded by a narrow reef. At one mile south, and distant respectively 2 miles and $5\frac{1}{2}$ miles south-west of it, there are shoals that uncover in parts, with a depth of 7 to 8 fathoms separating them, and with this depth also between them and the coast. S. 4° W. from Naguran there is a very small 16-foot patch, from which Guinlabagan island bears N. 63° E., distant 6 miles.

From Naguran islet there extends to the south-east a chain of islets and shoals, which range the coast at a distance of 3 to 4 miles from it. The shoals extend off to a distance of 12 miles from the neighbourhood of Buri point, in a south-westerly direction towards the banks north-east of the Gigantes group. It is probable that there are yet other reefs besides those marked on the chart; it would therefore be prudent to exercise the greatest care in navigating this sea, and to keep a good lookout from aloft.

Guinlabagan and Gilutugan islets are both situated on circular reefs $1\frac{1}{2}$ miles in diameter, and between them are three smaller islets, with rocks about them; the depth of water between the islets is 3 to $5\frac{1}{2}$ fathoms, and between them and the coast, 7 fathoms. Two miles N.N.W. of Guinlabagan there is a group of rocks, and N.E. by N. from the islet, off Balabao point, a small shoal; another shoal of sand and rocks $1\frac{1}{2}$ miles in extent, and covered by $3\frac{3}{4}$ fathoms water, lies $3\frac{1}{2}$ miles south-west of Gilutugan.

Little Naro, one mile in extent, is surrounded by a reef which extends to the distance of one mile. The islets Pobre and Guinlabagan, to the north and north-west of it, are surrounded by rocks. South-west of it is a shoal 2 miles in extent, east and west, the least depth over which is three-quarters of a fathom; on its southern part there are 3 to 5 fathoms.

Naro island, 2 miles in extent, and of regular height, is surrounded by a reef which extends half a mile to the north and one mile to the south, terminating to the south-west in a shoal of $2\frac{3}{4}$ fathoms, the outer limit of which, in 7 fathoms, is 3 miles from the island. A shoal $1\frac{1}{2}$ miles in extent N.N.W. and S.S.E., with three-quarters of a fathom on it, and 7 fathoms around, lies 5 miles S.W. by S. from the south point of Naro. At 3 miles south-east of the same point is the north-west head of a sand bank, which extends 5 miles to the south-east; the bank is 2 miles wide, and the least depth upon it is $2\frac{1}{4}$ fathoms. From the south end of this bank Kaduruan point bears S. 82° E., and mount Vigia, north. At one mile East of the south-eastern end of the bank is a patch of $2\frac{3}{4}$ fathoms, with depths of 5 to 11 fathoms around it.

Nabugtu and Nagarao, like all the other islets, are surrounded by reefs; from the latter a tongue of sand projects 2 miles to the south, with a depth of $1\frac{3}{4}$ to $3\frac{3}{4}$ fathoms on it, and $5\frac{1}{2}$ fathoms off the southern end.

Guinauayan islet sends out a reef from its east side to the distance of 2 miles, with a width of half a mile.

Coast.—Mount Vigia, on the Masbate coast, north-east of Naro island, is a remarkable high hill, the rounded base of which is called Buri point. The point is surrounded by rocks which, continuing to the north-westward, form a reef covered by $2\frac{3}{4}$ fathoms water, reaching as far as Balabao point, a distance of 11 miles; this reef, extending off the coast to $3\frac{1}{2}$ miles, entirely surrounds Piña island. From mount Vigia to Kaduruan point, $23\frac{1}{2}$ miles S.E. by E., the coast is clear, except at Nauko point, which is surrounded by a reef; the depths off it are 4 to 6 fathoms.

The towns of Guion, north of mount Vigia, and of Daraga, north of Nauko point, are of but little importance.

Kaduruan point, the south-east extremity of Masbate island, is long and sharp; a ledge of sand extends about half a mile from the point, outside of which it appears to be clear with a depth of 5 fathoms close to.

ISLANDS SOUTH of MASBATE.—The Manok-Manok isles are a group of three islets situated 8 miles S. $\frac{3}{4}$ W. from Kaduruan point; they lie in a general north and south direction, the southernmost and highest being 85 feet high. North of the islets the depth of 12 fathoms has been obtained at the distance of $1\frac{1}{4}$ miles, shelving gradually to 7 fathoms at 4 cables, bottom hard sand and boulders. These islands also appear to be clear on the south and east sides.

Karnasa island, 4 miles S.E. by S. of Manok-Manok, is a flat island $1\frac{3}{4}$ miles long and half a mile wide, with three pointed rocks at the distance of one mile from its south-east part.

Gato islet, lying 10 miles north of the nearest part of Sebu island, is small, 350 feet high, pyramidal in shape, and steep-to; it has a depth of 19 fathoms close to, and there is a clear passage between the islet and the island Malapascua, 8 miles south-eastward.

Tanguingui islet, situated $22\frac{1}{4}$ miles E.S.E. of North Gigante, is flat, with a few low bushes on it, and two low houses, the roofs of which, 32 feet above the sea, are the highest mark on the island; it is fringed by a sand beach. The water is shoal in its vicinity, and at half a mile from the south-west part the depth is $4\frac{1}{2}$ fathoms.

Shoals.—A rock, reported in 1680, covered by 3 fathoms water, position doubtful, is placed on the chart 3 miles west of Tanguingui. A bank of coral, covered by $2\frac{3}{4}$ fathoms water, lies midway between Tanguingui and the north coast of Bantayan; it is 2 miles long north-west and south-east, and one mile in width.

See chart. No. 2,577 [2,656].

NORTH and EAST COASTS of PANAY ISLAND

—**Tabun point** (*see* page 238) is flat and sandy, with a few trees on it; eastward of the point, less than a mile distant, are seven rocky islets; small craft can pass between them and the coast at high water.

Coast.—From Tabun point, the general trend of the coast is approximately E.S.E. for 73 miles to Bulakau point, the north-east extreme of Panay island; the shore is for the most part sandy, and the coast in its neighbourhood low.

Sabonkogon point, $3\frac{1}{2}$ miles east of Tabun point, with which it forms a small bay, is high and clear, and can be approached to within a short distance; from it to Ibahay point, 11 miles S.E. by E. $\frac{1}{2}$ E. the shore is clear and steep.

Ibahay point is sandy and flat, and on it is the town of the same name; north-east of the town there is good anchorage sheltered from southerly winds, but as during the S.W. monsoon the wind often veers suddenly to N.W., and Pontud bank would then be to leeward, a large vessel could not remain here with safety.

Sigayan point, 3 miles E. by S. of Ibahay point, and **Apga point**, $2\frac{1}{2}$ miles farther on, are both high and fringed by reef to the distance of one cable with a depth of 8 fathoms at the edge. Between these points there is a little bay, open to the north, and fronted by Pontud bank; the depths in it range from 11 fathoms, coarse sand, between the points, to 2 fathoms, sand, near the beach.

Pontud bank.—The south-east extremity of this bank is $1\frac{1}{2}$ miles N. by E. of Apga point whence it extends $2\frac{1}{2}$ miles to the north-west with a width of one mile. The depths on the bank are half a fathom in the centre, and 2 to 4 fathoms at the extremes, with 8 fathoms near the northern edge outside of which the depth rapidly increases to 100 fathoms. The channel between the bank and the coast, is clear and deep.

Aklan point and river are 8 miles E.S.E. of Apga point. The point, which is flat is formed by deposits from the river which flows out to the west of it. On the bar there is ordinarily five feet water, and with fresh N.E. breezes the sea breaks heavily on it.

Port Batan, 10 miles S.E. of Aklan bar, is a deep bay surrounded by low land cut into by several creeks. The entrance is open to the N.N.E. and can easily be recognised by Okbok hill, an insulated cliff with a flat top, situated 2 miles to the east of it, in low land near the beach. On each of the points that form the entrance there is a vantay, and both points send out banks, the one from the east point extends $1\frac{1}{2}$ miles N.N.E. and has three-quarters of a fathom on it, and 2 fathoms at the end; the bank from the west point extends half a mile to the north and has a depth of

See chart, No. 2,577 [2,656], and plan of port Batan No. 944 [2,657].

one fathom on it. Between these two banks is a channel a quarter of a mile wide and 6 fathoms deep, running approximately N. by E. $\frac{1}{2}$ E. and S. by W. $\frac{1}{2}$ W., that leads to the interior of the port which is completely sheltered from wind and sea. The bar fronting this channel has ordinarily $2\frac{1}{2}$ fathoms on it; but it is liable, as well as the banks from the entrance points, to shift with the freshets. There are no other dangers than these banks; they are not marked by stakes, but are indicated by the colour of the water over them.

Anchorage.—The best anchorage inside is in a depth of $5\frac{1}{2}$ fathoms, mud, before the town of Batan, of 8,400 inhabitants.

Shoal.—At about $2\frac{1}{2}$ miles northward of Baquiao point, the west entrance point of Sapián bay, there is a shoal of coral and rock, about half a mile in extent, with depths of 2 to 4 fathoms over it.

Sapián bay is 3 miles wide, and the same in length; it is clear, with a depth of 4 fathoms at the entrance, and 3 fathoms in the centre of the bay. It is sheltered from all winds but those from the northward.

Mobai and Tuat are small rocky islets, with trees upon them. Mobai is clear, with depths of 3 fathoms off it; but Tuat has rocks on its northern and southern sides. The point south of these islets is fringed with rocky islets and shoals of 2 fathoms.

Nipa point is high and steep, and there are two flat rocks three-quarters of a mile north of it; the northern rock covers at very high tides. Between these rocks the depth is 3 to 4 fathoms, and between the south rock and the point 3 fathoms; close outside the rocks there are depths of $5\frac{1}{2}$ to 7 fathoms.

Kapiz roads offers an anchorage in a depth of 6 fathoms, sheltered from the north-east between the bar of the river Kapiz and Nipa point; the roads are open to north-west winds.

Kapiz river, one of the most important in the island of Panay, is protected by a bar of sand, on which there is a depth of 4 or 5 feet at low water. Within the bar the depth increases to 3 fathoms, and continues that depth for 3 miles, as far as the town of Kapiz, which has a population of 23,000, and carries on a brisk native trade, principally in the export of rice. Steamers from Manila call weekly.

Olutaya island, one mile in length, and very narrow, has two rocks above water lying off its north-east part, and another off its south-west end. The coast of the island forms little bays in which coasters find anchorage in a depth of 3 to 4 fathoms; the passage between it and Panay is blocked.

Between Olutaya island and Bulakau point there is a great bay, the southern part of which is filled up with Kasamayan bank, extending 3 miles from the shore.

Tukat bank, 3 miles north-west of the town of Sanayon, on the south-eastern shore of the bay, is three-quarters of a mile long, east and west, and half a mile wide; it consists of sand and rock, and the middle part uncovers at very low tides. From the centre of the bank, Sharp peak, 2,815 feet in height, bears S. $\frac{1}{2}$ W., and Olutaya island W.N.W.

Bulakau point, the north-east extremity of Panay island is a spur from the mountain Sibala, which has an elevation of 1,959 feet; the point is low, and terminates in a sand spit with rocks at the end, which extend out for a distance of 3 cables and uncover at low water.

Tidal streams.—In the waters north of Panay, sometimes called the sea of Kapiz, the flood stream enters from the westward by the passages between Panay, Karabao, and Tablas, and also by the passages between Tablas, Romblon, and Sibuyan.

This last stream passes along the south-west coast of Sibuyan and between Kaut point and Cresto de Gallo, with great strength, but on the east coast of Sibuyan it meets the flood stream from the eastward by the strait of San Bernardino, and loses all its force.

The ebb stream moves in the reverse direction, and by the same passages, and is not felt on the south-west coast of Sibuyan.

The stream, at full and change, runs at the rate of $3\frac{1}{2}$ miles an hour between Panay and Tablas, and at 2 miles an hour between Tablas and Sibuyan.

JINTOTOLO CHANNEL is the name given to the passage between the south-west point of Masbate, and the north-east point of Panay. Jintotolo island, already described (see p. 255), and the Zapato-, three islets on a bank lying 6 miles south-west of Jintotolo island, divide the channel into three passages; that between Jintotolo island and the Zapatos is generally used.

Zapato Mayor is 260 feet high, wooded and cultivated; a shoal extends one mile westward from the island, which has a depth of $3\frac{1}{2}$ fathoms over it, and 6 fathoms at the edge.

Zapato Menor is 270 feet high, bare, and clean on all sides except the western, from which there projects a narrow ledge.

The little islet, Chinela, between the two Zapatos, is fringed by reef for a distance of from 3 to 4 cables. The depth of water on the bank and between the islets is 5 to 8 fathoms.

Elcano shoal, $4\frac{1}{2}$ miles in length east and west, and narrow, with depths of $5\frac{1}{2}$ to 10 fathoms, is of importance as lying close to one of the

See chart, No 2,377 [2,656].

most frequented routes of the Archipelago. From the position in $5\frac{1}{2}$ fathoms at its east end, Zapato Mayor bears S.S.E. $\frac{3}{4}$ E., distant 8 miles, and Pulanauta point E. $\frac{3}{4}$ N. No close examination has been made of this shoal.

Cucaracha shoal, 6 miles N.N.E. $\frac{1}{2}$ E. of Bulakau point, and 11 miles E.S.E. of Zapato Mayor, is a circular bank, $1\frac{1}{2}$ miles in diameter, covered by $2\frac{1}{4}$ fathoms, with one rock nearly awash on its northern part.

ISLANDS OFF THE EAST COAST OF PANAY.—**Manigonigo**, $1\frac{3}{4}$ miles E. by N. $\frac{1}{2}$ N. of Bulakau point, is a conical islet small and sandy, 90 feet high, surrounded by rocks to the distance of one cable on all sides but the south, in which direction foul ground extends to 2 cables. The channel between the islet and the point has a depth of $2\frac{3}{4}$ to 4 fathoms, and is only fit for small craft; a dangerous rock covered by $1\frac{3}{4}$ fathoms water, lies one mile S.S.W. $\frac{1}{4}$ W. of Manigonigo, and less than $1\frac{1}{2}$ miles from the Panay coast.

LIGHT.—From an iron cylindrical grey tower, 29 feet in height, on Manigonigo islet, at an elevation of 68 feet above high water, is exhibited a *flashing white* light every *five seconds*, which is visible in clear weather at a distance of 14 miles.

The keepers' dwellings, adjoining the lighthouse, are of brick and grey stone with iron roofs.

Tidal streams.—The tidal streams are strong off the north-east point of Panay, the flood tide sets to the east, and the ebb to the west.

Nabunut, 3 miles E. by S. of Bulakau point, is an islet one mile in extent and 100 feet high; it is surrounded by rocks which extend 4 cables from the islet south-westward. A patch of 2 fathoms lies at the distance of $1\frac{1}{4}$ miles south-west of the islet.

Tulunanaun, $1\frac{3}{4}$ miles south-east of Nabunut, is $1\frac{1}{2}$ miles long and has a hill 200 feet high on its northern part; it is encircled by rocks to the distance of 2 cables. The channel which separates it from Nabunut has a depth of from $2\frac{1}{2}$ to 4 fathoms. At one mile south-east of Tulunanaun there is a patch of $3\frac{1}{2}$ fathoms.

Balbagan is about a mile long north and south, narrow, and 100 feet in height; it is surrounded by rocks, and by a shoal which extends from it about one mile to the north and north-east, and 2 miles to the south; the west coast is clear at the distance of 2 cables. At $1\frac{1}{2}$ miles E.S.E. of Balbagan, between it and South Gigante there are rocks awash at low water, and at the northern entrance of the channel, between it and North Gigante, a patch of $5\frac{1}{2}$ fathoms.

The channel between Balbagan and Tulunanaun has depths of 7 to 14 fathoms, and is clear with the exception of a $2\frac{1}{2}$ -fathoms patch lying midway between Balbagan and Nabunut, and another patch of $3\frac{1}{2}$ fathoms situated $1\frac{1}{2}$ miles west of Balbagan; the depths on the western side of this channel are from $3\frac{1}{2}$ to 6 fathoms, and irregular. Vessels of large draught, however, will do well to take the passage north of the Gigantes, rather than that between Balbagan and Tulunanaun islets.

GIGANTES ISLANDS are a group of two islands of moderate height, together with several islets, and some sharp-pointed detached rocks. The group is clear on its northern side, and the shoals on the other sides do not project more than three-quarters of a mile.

North Gigante, or **Sibuluak Babai**, is 2 miles long north and south, and one mile wide, with a wooded hill on either extremity; it is surrounded by a shoal which extends half a mile to the east and west. At 7 cables east of the north-east extremity lies the islet Uaidajon, clear and steep, with a depth of $5\frac{1}{2}$ fathoms between it and North Gigante; on the south-east edge of the bank there are three detached rocks.

LIGHT.—On the north-east point of North Gigante island is exhibited a *group-flashing white and red* light, with a period of system of *fifteen seconds*, thus:—*white* flash; eclipse; *white* flash; eclipse; *white* flash; eclipse; *red* flash; eclipse. It is visible from N. 75° E., through east and south to N. 70° W., but obscured in that arc from S. 88° W., through west, to N. 84° W. by Uaidajon island; the light is elevated 78 feet above the sea, 38 feet above the ground, and is visible from a distance of 14 miles in clear weather.

The lighthouse is a cylindrical tower, on a quadrangular base, and has an iron balcony round the upper part, the whole painted light grey. The keepers' dwellings, painted a light colour, are situated at the rear of the lighthouse.

South Gigante, or **Sibuluak Lalaki**, half a mile south of the northern island is of irregular form, and about 2 miles in length from east to west. On its northern side is a reef which dries, and forms, with the reef of the northern island, a shallow channel, with a depth of $1\frac{1}{2}$ fathoms; the other sides are clear. At 8 cables south-east of South Gigantes are three small islets; the southernmost, named Antonia, is clear, except on its northern side. Between these islets and South Gigantes there is a channel in which the depth is 6 to 8 fathoms.

Anchorage.—In the N.E. monsoon vessels can anchor off the south-west coast of South Gigante in a depth of 7 fathoms, mud and sand. In the S.W. monsoon very small vessels can anchor in the channel between the islands.

See chart, No. 2,577 [2,656].

Bank.—About 5 miles N.E. by E. $\frac{1}{2}$ E. from the north-east point of North Gigante, is the shallowest part ($3\frac{1}{2}$ fathoms) of a bank, which extends approximately 9 miles E.S.E. and W.N.W., with a mean width of $3\frac{1}{2}$ miles. The depth on it is irregular, from $3\frac{1}{2}$ to 9 fathoms. The bank lies between the bearings N.E. by N. and E. $\frac{1}{4}$ N., from the north-east point of North Gigante. The channel between the shallow part of the bank and North Gigante, is the most open and direct for vessels proceeding to or from the Jintotolo channel.

Isolated shoals.—Within a radius of 12 miles from N.W. by W., through north and east, to S.E. by E. of North Gigante, there are a certain number of isolated patches, covered by $4\frac{1}{2}$ to 7 fathoms water. The north-easternmost of these, of $4\frac{1}{2}$ fathoms, has not been examined; and the position of another, of 6 fathoms, near the edge of the last described bank, is doubtful.

Coast.—From Bulakau point, the coast trends S.S.E. for $2\frac{1}{2}$ miles to the bluff Kamboloton, and thence forms a wide but shallow bay, fronted by the island Binuluangan, and terminated by Gogo point, $4\frac{1}{2}$ miles south of the bluff. This bay, which is named Bankul, has only a depth of $1\frac{1}{2}$ fathoms at high water, and at low water several sand banks appear which block the passage to the three rivers that fall into it.

Binuluangan (Balin) island is $3\frac{1}{2}$ miles long, low and of irregular shape; it has a surrounding reef, upon which are several rocky islets.

Kalaguan island is separated from Binuluangan by a channel 7 cables wide at the north-east end, but almost closed to the south-west: it is $3\frac{1}{2}$ miles long north-east and south-west, 3 miles wide, and of regular height. The east coast is clear and steep, but the north-east point has several rocks around it; at a distance of $3\frac{1}{2}$ miles east of the north point there is a patch of 6 fathoms. Anchorage may be had south of Kalaguan in a depth of 7 fathoms.

Cañas is a small islet off the east coast of Kalaguan, half a mile long, east and west, of middling height, and with a depth of 7 fathoms at the distance of one cable from its east side. In the channel between it and Kalaguan the depth is 7 to 11 fathoms.

Sikogon, 6 cables south-east of Kalaguan, is high and $2\frac{1}{2}$ miles in length north-east and south-west. The north-east part has a reef 2 cables in width, on which there is a little islet, steep on the outside; this reef fringes the island on its northern and western sides, but the south-east coast is clean and steep. A shoal of small extent with a depth of about 6 feet on it, lies one mile south of the southern point of Sikogon.

At $2\frac{1}{2}$ miles E.N.E. of the little islet on the north-east side, is a patch of $4\frac{1}{2}$ fathoms, with deep water around.

Carmencito shoal, small, and composed of sand and rock, has a depth of 5 feet least water upon it, and 4 to 6 fathoms at the edges. It

bears S. 42° E. one mile from the east point of Cañas, and is distant 9 cables from the north coast of Sikogon.

Sikogon channel, between Sikogon and Kalaguan, is half a mile wide, and carries a depth of 7 to 12 fathoms; it is clear and safe, and is the channel recommended for vessels making for Iloilo strait.

Coast.—South of Gogo point is the sheltered anchorage of Estancia, with a depth of 2½ to 6 fathoms between the little isle of Luginut (south-west of Kalaguan) and the Bayas isles. The town of Estancia is a mile inland, and there is a good road to it from the coast. From Estancia anchorage southward the coast is foul, and should be avoided till off the island Ragalumbi, which is high; it then forms two bays, which afford fair shelter and anchorage in westerly winds.

Bayas isles are a group of four islets of little height, near the coast, about 3 miles S.S.E. of Gogo point. They extend 1½ miles from east to west and are surrounded by sand banks, and rocks, with no passages between them. At one mile west of the south point of the largest isle, there is a shoal, awash at low water; between Bayas and the island to the northward, Luginut, there is another patch covered by half a fathom.

Culebra.—Midway between Sikogon and Pan de Azucar island, is the small island Culebra about 200 feet high, with a ledge of sand and rock extending 6 cables westward from it; there is a depth of 11 fathoms at a short distance from the island and from the reef.

Shoals.—There are three shoals northward and eastward of Culebra. The northernmost, 2½ miles N.E. ¼ N. of Culebra, is one mile in extent, with a least depth of 2 fathoms; the easternmost lies 4 miles E.N.E. of Culebra, and has a depth of 1½ fathoms; and the southernmost shoal is situated 2½ miles E. by N. of Culebra with 1½ fathoms least water. These three shoals have depths of 8 to 20 fathoms around them, which is the general depth off the N.E. coast of Panay.

About 5½ miles south-east of Culebra, and at the same distance eastward of Pan de Azucar, there is a shoal about 3 miles in extent, upon which the depth is 2½ to 3½ fathoms; it is surrounded by a depth of about 14 fathoms.

Pan de Azucar (sugar loaf) is the largest of a group of five islands near the coast of Panay at the northern entrance of Iloilo strait. Its base is 3½ miles in extent, and it has two remarkable peaks, the highest of which is elevated 2,037 feet. The north coast sends out a reef to the northward, which terminates in a rock at the distance of half a mile from the island. The east coast is clear. Between this island and Tagil, to the south-west, there is a narrow channel in which the depth is from one to 1½ fathoms.

Bagaisi, one mile north of Pan de Azucar is steep-to. Naburut, 4 cables from its north-west shore is also clear of fringing reef.

Midway between Pan de Azucar and the coast of Panay there is a small shoal, one cable in extent, and awash at low water; between the shoal and Pan de Azucar the depth is 3 fathoms.

Buglug on the south-east coast of Pan de Azucar is united to that island at low water; it is clear and steep-to on the east side.

Malangaban, $1\frac{1}{2}$ miles south-east of Pan de Azucar, and nearly round in shape, is high, clear, and deep off its western part; the little islet close to its south-west part is also clear. The channel between Malangaban and Pan de Azucar carries a depth of 9 to 12 fathoms.

Dunwo, an islet lying between Malangaban and Bulubadiangan, is small and has a narrow fringing reef; the channel between it and Bulubadiangan has a depth of $3\frac{1}{4}$ fathoms.

Bulubadiangan, 2 miles S.S.E. of the south point of Pan de Azucar, is triangular in shape, of moderate height, clear, and steep-to; off its south point are two islets joined to the point by a reef.

Baliguian, 9 miles East of Bulubadiangan, is a small islet, 150 feet high surrounded by a narrow reef, falling abruptly into depths of 15 to 20 fathoms. This islet is a good natural mark for vessels making Iloilo strait from the northward and from the eastward, and is useful for clearing the numerous shoals about the route.

Shoals.—The three shoals nearest to the track recommended are—one of $2\frac{1}{2}$ fathoms, lying S. by W. $1\frac{1}{2}$ miles of Baliguian; another of $2\frac{3}{4}$ fathoms, situated N.E. $\frac{1}{2}$ E. $3\frac{1}{2}$ miles from it; and the third of $3\frac{3}{4}$ fathoms lying N.N. E. $\frac{1}{4}$ E. $4\frac{1}{2}$ miles from the same island.

A written description of the many other shoals which encumber the channel north of Negros island, between the N.E. part of Panay and the island Bantayan, would be needless; they can best be understood from the chart.

Tagil island, between Pan de Azucar and the headland of Bakahan, is $3\frac{1}{2}$ miles in length north and south, and of moderate height. The eastern shore is clear and steep, with the exception of a small shoal that projects from the middle of it. The western shore and the south point send out reefs, and off its south-west part is a rocky shoal, awash at low water. The passages which these reefs and shoal form with the coast of Panay, have a depth of $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms.

Sombrero, half a mile N.W. of the north-west point of Bulubadiangan, is round, high, and steep-to. At its south-east part there is anchorage in 9 fathoms, mud, sheltered from south-west winds. The channel between it and Bulubadiangan is clear, with a depth of $6\frac{1}{2}$ fathoms.

Bagabu is a small islet lying near the south point of **Tagil**, from the south end of which a point of sand and rocks projects a short distance. The channel between this islet and **Bulubadiangan** is $1\frac{1}{2}$ miles in width and carries a depth of 7 fathoms.

Tagubanhon island, 4 miles in length N.E. by N. and S.W. by S., and 2 miles wide, lies a little more than a mile south-eastward of **Bakahan** headland on the coast of **Panay**, with which it forms the strait named **Apiton**. The island is high, clear, and steep-to.

Apiton strait is the southern termination of the inner route to **Iloilo** strait from the northward; it is clear, with a depth of 9 to 11 fathoms, and the coasts on either side are steep.

Anauyan is a small island 336 feet in height, lying 2 miles E. $\frac{1}{2}$ S. from the south end of **Tagubanhon**; between it and **Tagubanhon** the depth is 12 fathoms.

Turia rock, about 100 feet in extent, with 5 feet water on it and a depth of 8 fathoms close around, is situated 4 miles S.W. $\frac{1}{2}$ S. from **Anauyan**, and forms a serious danger in the route to **Iloilo** strait. From the rock, **Calabazas** lighthouse bears N. 74° W., distant $5\frac{1}{2}$ miles.

Anchorage.—The *Challenger* in October 1874 anchored for the night north of **Anauyan** in a depth of 10 fathoms with the right tangent of **Tagubanhon** bearing North, and the left tangent S. 53° W. There is also anchorage off the north-west side of **Tagubanhon**, and off **Bakahan** bluff.

S.E. COAST OF PANAY.—The north side of **Apiton** strait is formed by a rocky headland, **Bakahan** bluff, high, clear, and steep-to, with a little islet joined to its south-west part. On the south side of the bluff is **Abra de Apiton**, a creek with an entrance channel one fathom deep, close to the north shore; inside there is a depth of 3 fathoms, and anchorage for small craft.

Water.—There is a watering place on the north shore near the first beach at the entrance; water can also be obtained on the south side, but here it is not so good.

West of **Abra de Apiton** the coast forms a bay, **Ajui**, $3\frac{1}{2}$ miles wide, in which there is shelter from north-east winds. The river **Ajui**, leading to the town of the same name, enters on the north shore; it has a depth of one to $1\frac{1}{2}$ fathoms at high water.

Binanan islets are two small islets in the middle of the bay, near the coast; between them, and about them the depth is $4\frac{1}{2}$ fathoms.

On the western shore of **Ajui** bay are the towns **Mangurukuru** and **Pili**, the latter standing on a little height on the western point of the bay. **Sal**

See chart, No. 2,578 [2,648].

islets are united to the coast off Pili by a reef having three-quarters of a fathom on it at low water.

Calabazas isles are two small islets, situated about a mile to the southward of the Sal islets, and nearly the same distance from the coast of Panay; there is anchorage northward of them in a depth of $5\frac{1}{2}$ to 7 fathoms.

LIGHT.—From a lighthouse 38 feet in height, elevated 100 feet above high water, and situated about 220 yards N.N.W. from the south extreme of the eastern Calabazas islet, is exhibited a *group-flashing white* light, with a period of *fifteen seconds*, showing groups of *three flashes*. It is visible at a distance of 16 miles in clear weather, when bearing from S. 5° W., through west and north, to S. 81° E.

A ray of *red* light, visible on the bearing N. 39° E., is shown over Pepitas rocks, and can be seen for a distance of $1\frac{1}{4}$ miles south-westward of them.

The lighthouse is a cylindrical iron tower, on a quadrangular base, painted grey and white, with the keepers' dwellings, painted white and green, attached.

Pepitas rocks, situated $1\frac{1}{4}$ miles to the southward of the Calabazas are some black rocks 7 feet high, about one cable in extent; vessels can pass between them and the coast, and also between the rocks and the Calabazas, but the main channel lies eastward of them.

Coast.—Kulasi bay and Cañas gulf offer no shelter. Barotak bay has a depth of 3 fathoms; a river of the same name enters it, in which boats can ascend at high-water to the town of Barotak. The point which separates this bay from the next to the southward, Banate, is surrounded by rocks, steep-to, which continue round the shore in front of the town, Banate. From here the coast trends to the southward for 13 miles to Dumangas point, and then west 4 miles to the river Dumangas; it is low and covered by mangroves, and is unapproachable on account of shoal water, there being a depth of $1\frac{1}{2}$ fathoms at a distance of 3 miles from the shore northward of Dumangas point, in places. The rivers Anilao and Dumangas are shallow, and boats can only enter them at high water.

Mounts Orok and Saligit are of about equal height, but mount Orok has a small sharp peak, and mount Saligit a long flat summit. When in line they serve as marks for the eastern end of Iguana shoal. Mount Polau is low, and not conspicuous until bearing west.

Tomonton shoal, off Tomonton point in Negros, stretches $2\frac{1}{2}$ miles to the north-west from that point, and must be given a wide berth; it has a depth of 2 fathoms upon it, and is said to be extending.

Iguana bank is a bank of sand about $3\frac{1}{4}$ miles in length E.S.E. and W.N.W. within the 4-fathoms limit, and three-quarters of a mile wide at its eastern part, tapering westward to a broad point; it lies between Dumangas point and Guimarás island near the middle of the north-eastern approach to Iloilo strait, leaving channels on either side about three-quarters of a mile in width. The depth on the eastern half of the bank is from 8 feet to 3 fathoms, and on the western portion from $3\frac{1}{4}$ to 4 fathoms generally, with two patches of 2 and $2\frac{1}{4}$ fathoms respectively.

The part of the bank covered with less than 4 fathoms water, lies approximately between the bearings S. 54° E. and S. 74° E. from Siete Pecados lighthouse, on which arc of 20° the light shows a *red sector*; the northern limit of this sector does not clear the bank but falls over the edge of it in a depth of 3 fathoms, which must be remembered in passing. Mounts Orok and Saligit in line over Dumangas vantay, bearing N.N.W. $\frac{1}{4}$ W., clear the eastern end of this shoal.

In the northern channel the least depth is 4 fathoms, and in the southern $6\frac{1}{2}$ fathoms at their eastern entrances. The tidal streams set with great force over Iguana bank.

Siete Pecados is a cluster of rocks lying in mid-channel off the north end of Guimarás. The highest, from which a light is exhibited, is steep, as are also the other rocks; but on the ends of the shelf on which they stand, about half a mile in extent north-east and south-west, there are rocks with very little water on them. A pinnacle rock with 4 feet water over it, lies 90 yards from the north-west islet of the group; it has a depth of 8 fathoms all round it, and lies out of the usual track.

The channel between the Siete Pecados and the coast of Panay is half a mile wide, and 9 to 20 fathoms deep; the passage between these rocks and Guimarás is of the same width, with a depth of 7 to 10 fathoms. Both channels are clear, but the northern is preferable.

From the Siete Pecados to the port of Iloilo the channel is clear.

LIGHT.—From a cylindrical iron lighthouse, 29 feet high, coloured bluish grey, on the largest islet of the Siete Pecados group, at an elevation of 98 feet above high water, is exhibited a *fixed white* light showing a *red sector* through an arc of 20° between the bearings of N. 54° W. and N. 74° W. over Iguana bank; the light is visible in clear weather from a distance of 11 miles.

Tidal streams.—The flood tide in Iloilo strait sets to the north as far as Tagubanhán, approximately, when it meets the other branch of the flood tide coming from the northward. The ebb stream runs in the opposite direction, *i.e.*, to the southward in Iloilo strait, and to the northward

north of Tangubanhon. The tidal streams in the strait attain a rate of 4 to 5 miles an hour.

GENERAL DIRECTIONS from Verde island passage to Iloilo.—Eastern route.—The directions for Verde island passage as far as Dumali point have been given in the last chapter; see page 232. From a position 4 miles north-east of Dumali point a S.E. course will lead between Dos Hermanas and Maestre de Campo islands and south of Simara; then Cobrador island should be steered for until the channel opens between Romblon and Tablas islands. After rounding the north-east point of Tablas a South course takes a ship in mid-channel and clear of all danger. The light of port Romblon is badly placed, and scarcely discernible from the offing; it is not an official light. By night this South course should be kept for 14 miles, then a S.E. by E. course leads 2 miles south of the southern end of Cresta de Gallo reef and midway between Jintotolo island and Zapato Mayor; this track passes close northward of Elcano bank, which it is as well not to cross. If the weather is misty the first land seen will probably be the high and conical hill of Olutaya on the northern coast of Panay.

From a position 2 miles south of Jintotolo island a course S.E. by E. $\frac{1}{4}$ E. should be steered for 9 miles until the peak of Pan de Azucar bears S. by W. $\frac{1}{4}$ W., and then a South course towards the highest hill of Sikogon island. This will lead between Balbagan and Tulunanaun islets, in depths of 7 and 8 fathoms, and half a mile east of the $2\frac{3}{4}$ -fathoms patch between Balbagan and Nabunut islets; the east point of Cañas islet in line with the highest hill of Sikogon will clear the above $2\frac{3}{4}$ -fathoms patch.

When east of the north point of Kalaguan islet steer for the middle of the channel between Kalaguan and Sikogon, passing west of Cañas. This channel being passed, steer S. by W. $\frac{1}{2}$ W. to clear the reef extending westward from the island Culebra; and when west of that island steer to pass between Buglug on the south-east coast of Pan de Azucar and Malangaban. Then proceed between Bulubadiangan and Sombrero, which is half a mile north-west of it; continue on through Apiton channel between the coast bluff and Tagubanhon, and enter the strait of Iloilo. All these channels are clear and the least depth in them is 7 fathoms. After leaving Apiton channel the Calabazas islands and Pepitas rocks will be passed at the distance of one to 2 miles.

Vessels drawing less than 13 feet can pass between Bulakau point and Manigonigo islet, but this channel is not recommended.

If it is proposed to proceed outside the islands, after passing between Balbagan and Nabunut, when abreast of Tulunanaun steer S. by E. $\frac{1}{2}$ E. until Baliguian islet bears South; a course for that islet will then lead midway between the $2\frac{3}{4}$ -fathoms and $3\frac{3}{4}$ -fathoms patches described at pages 264 and 265. Pass westward of Baliguian, when a course S.W. $\frac{1}{4}$ W.

See charts, Nos. 2,577 [2,656]; and 2,578 [2,648].

will lead between Anauyan and Ilakaon on the north coast of Negros; be careful to avoid Turia rock. To clear this danger a vessel should not bring Anauyan islet to bear eastward of N.N.E. $\frac{1}{4}$ E., until Calabazas lighthouse bears W.N.W., she can then steer W.S.W.

If it is preferred to pass northward and eastward of the Gigantes, North Gigante should be passed at the distance of $1\frac{1}{2}$ miles, and either the Sikogon and Apiton passage may be taken, or the Anauyan channel.

From Apiton pass or Anauyan channel, whichever has been taken, a course should be steered to pass 3 miles from Tomonton point in Negros, and then a S.W. by S. course should be preserved for a distance of 12 miles, keeping a look out for the reefs off the coast of Panay. When Siete Pecados lighthouse bears W. $\frac{1}{4}$ N., it should be steered for and the fishing stakes on the Panay side be gradually approached; this will lead clear of the shoal water off Dumangas point and that of the western part of Iguana bank. These fishing stakes are generally in 2 fathoms water, and at one or two cables from them the depth is 9 to 11 fathoms.

Directions for Iloilo strait.—Coming from the eastward and passing north of Siete Pecados vessels should round Dumangas point at a distance of one mile, and keep within the limits of the bearings of the *white* light of Siete Pecados, avoiding the *red* sector; see page 268. From abreast the lighthouse, a mid-channel course should be maintained to Kabugao point, when the lighthouse, or *red* light at Iloilo may be steered for, keeping rather to the Guimará's shore.

To pass southward of Siete Pecados, the lighthouse or light should be approached bearing about N.W., avoiding the *red* sector, and the bank extending about one mile north-eastward of Nabalas village. A small shoal of $3\frac{1}{2}$ fathoms lies in mid-channel, about South from the lighthouse, which will be avoided by keeping more towards the islets as the bearing of North is approached. When westward of the light, proceed as directed before, but particular care must be taken when rounding the south-west end of Siete Pecados shelf, where there is a rock that uncovers one foot at the distance of 3 cables from the lighthouse.

Northward from port Iloilo.—Leaving Iloilo by the eastern channel, the Pecados rocks, in line with a fall of the hills in the back range of Panay island bearing W. $\frac{1}{4}$ N., will lead between Iguana bank and the shoal water off the northern shore; and when mounts Saligit and Orok are in line, bearing N.N.W. $\frac{1}{4}$ W., and Tomonton point bears N.E. $\frac{1}{4}$ E., a N.N.E. $\frac{1}{2}$ E. course may be taken.

See chart, No. 2,578 [2,648], and plan No. 2,391 [2,649].

CHAPTER VII.

NEGROS, SEBU, BOHOL, AND LEITE ISLANDS; SURIGAO STRAIT, AND THE NORTH AND WEST COASTS OF MINDANAO.

VARIATION, $0^{\circ} 55'$ East in 1902.

NEGROS ISLAND.—So called from the number of Negrotis or Aetas, found on it by the Spaniards, is about 118 miles long, and, though so much larger than Sebu island, is neither so rich nor so populous. Its coast is very little broken by bays or inlets, and does not contain any good harbour. A central chain of mountains runs through it from north to south, which attains a height in mount Malaspina, of 8,192 feet. The rivers are but small, and unfit for the navigation of vessels of burthen.

The island produces the best cacao in the Bisayas, besides rice, maize, sugar, tobacco, cotton, and abacá. The population in 1899 was estimated by the Philippine Commission to be about 392,000 chiefly Bisayans. The area of Negros is 4,854 square miles.

Communication.—Negros is connected at its southern end by submarine cable with Mindanao, and at its north-west end with Iloilo in Panay, and is thus united to the general telegraphic system.

NORTH and NORTH-WEST COASTS of NEGROS.
—**Bito point**, the north-east extremity of the island, is of no great height, rocky, and fringed to the distance of half a mile by a shoal which dries in places at low water. The space between this point and the Don islets, situated 7 miles north-eastward, has not yet been surveyed.

Bokabok island, $2\frac{3}{4}$ miles north-east of Bito point, is half a mile in extent and stands, along with several islets and rocks westward of it, on a shoal 4 miles in length north-west and south-east, and $2\frac{1}{2}$ miles in width.

Coast.—From Bito point to the northern extreme of the island, 18 miles W. by N., the shore is foul and rocky, with depths of $3\frac{1}{2}$ to 5 fathoms at a distance of $2\frac{1}{2}$ miles from it. Three sandy shoals, which uncover at low water, lie N.N.E. $\frac{1}{2}$ E. of Guimugahan point; the southernmost being distant $3\frac{1}{2}$ miles, and the northern shoal 10 miles from the point. The

See chart, No. 2,578 [2,648].

north point of the island is an extensive, rounded, sandy cape, on which is a *vantay*; it is surrounded by a shoal extending 4 miles to the northward, upon which stands Ilakaon islet.

From the north point to Tomonton point 15 miles W.S.W., the shore is a long sandy beach, with a depth of 3 fathoms at the distance of about a mile from it. From Tomonton point, a shoal extends $2\frac{1}{2}$ miles to the north-west, upon which the depth is 2 fathoms. Vessels navigating Iloilo strait must give this point a berth of 3 miles; see page 267.

From Tomonton point to Pandan, 24 miles S. 20° W., the coast is low, and bordered by a long sand beach, with depths of $5\frac{1}{2}$ fathoms at $1\frac{1}{2}$ miles from it, but shoal patches are reported to lie off Silay, at the distance of 2 to 3 miles. There is anchorage off Silay at the distance of 3 miles from the shore, in a depth of 5 fathoms with the church bearing E. $\frac{3}{4}$ N.; also off Bakolod in 5 fathoms, about $2\frac{1}{2}$ miles from the shore, with the church bearing S.E. $\frac{1}{2}$ E.

Pandan point, which with Guimarás island forms the narrow strait of Guimarás (see p. 243), has rocks on its north-west side, projecting to half a mile, and a shoal one mile westward upon which the depth is 3 fathoms.

From Pandan point the coast continues low for 28 miles to the southward, as far as the town of Suay, near the river Himamaylan. The $1\frac{1}{2}$ -fathoms shoal which borders Pandan point grows out between that point and Makikili, to the distance of 4 miles from the land, almost joining the bank south-east of Ilampulugan island; but, to the southward of Makikili point, it closes the coast and a depth of $3\frac{1}{2}$ fathoms is generally found at the distance of one mile from the shore.

River Himamaylan.—Of the several small rivers that enter the sea on this coast, this river, near the town of the same name in the angle that the coast makes to the westward, is the most important. The entrance is indicated by stakes, placed in a depth of $1\frac{1}{2}$ to 2 fathoms; within the river, the deepest anchorage is near a cove on the left bank. Near Suay the coast curves to the westward, and increases in elevation; about Sojoton point it is high.

Shoal.—A patch of $5\frac{1}{2}$ fathoms lies $1\frac{3}{4}$ miles north of the town and hill of Tantauayan, with a depth of 50 fathoms at the distance of $1\frac{3}{4}$ miles to the northward of it.

WEST COAST of NEGROS.—Sojoton point is surrounded by reefs to the distance of half a mile, with a depth of 7 fathoms at the edge, and 27 fathoms at $1\frac{3}{4}$ miles to the west of the point. Maguiliquian point, a wooded bluff, is also surrounded by rocks. Linaon bay, between these two points, affords anchorage in case of necessity in 7 to 9 fathoms, fine sand.

Shoals.—A small rocky shoal, with $3\frac{1}{2}$ fathoms on its outer edge, lies S.S.W. half a mile from Maguiliquian point; and another, with a depth of 8 fathoms on its outer edge, lies $1\frac{1}{2}$ miles from the point, on the same bearing.

Danjugan island, $1\frac{1}{2}$ miles north-west of Kokaguayan point, is one mile long, north and south, and is surrounded by a narrow, steep reef; between it and the coast is another little islet, the channel between which and the coast has a depth of 8 fathoms.

Binigsian point.—Two miles north of this point are Anajauan island and four other little islets close to it. South of the point there is anchorage in a depth of 9 to 17 fathoms, where good water may be obtained; still farther south are the bays of Cartagena and Sipalay.

Matatindok point is steep, with a flat crown, and is surrounded by rocks, one of which has the appearance of a vessel under sail.

Campomanes bay, south of Matatindok point, is clear, and of great depth, with very steep shores, there being 17 to 28 fathoms almost touching the shore. Nabulao bay, immediately south of Campomanes, is obstructed by an islet, and by a reef which extends from both sides: before it is a shoal, surrounded by deep water, situated three-quarters of a mile south of the point between the two bays.

SOUTH-WEST AND SOUTH-EAST COASTS.—From Campomanes bay to Kaitan point the shore is rocky; but it is safe to approach and steep-to, there being depths exceeding 37 fathoms at the distance of half a cable in many places. From Kaitan point to Siaton point, the south extremity of Negros, the coast is also clear and steep-to, and presents several beaches including the mouths of small unimportant rivers. During the north-east monsoon vessels can anchor off the town of Tolon, of 1,800 inhabitants, but boats can only enter the river at high water.

From Siaton point to Dumaguete point the shore is sandy and clear, with depths of $2\frac{3}{4}$ to 6 fathoms at one cable from it, falling then abruptly to 32 fathoms.

Port Bombonon, one mile north-west of the point of the same name, is 2 miles in length, has a depth of $5\frac{1}{2}$ fathoms and is completely sheltered; but the entrance is reduced to a width of 75 yards, and a depth of $2\frac{3}{4}$ fathoms by a ridge of rocks extending from the south shore.

Port Siit is small but clear, with good holding ground, and sheltered; the depth within is from $3\frac{3}{4}$ to 8 fathoms, and there is a rivulet with good water.

Samboanguita point is flat and sandy; a shoal of 2 fathoms extends to the distance of 2 cables from it. South of the point there is

See chart, No. 2,578 [2,648].

good anchorage in a depth of 7 fathoms. The town of Samboanguita, of 3,700 inhabitants, is situated one mile inland of the point.

Dauin point is sandy and flat, with trees on it rather higher than those that grow on the other points of the coast; it can be passed close-to, being clear and steep—as is also the entire coast between points Samboanguita and Dumaguete, with the depth of 12 fathoms at a short distance.

Apo island lying $3\frac{1}{2}$ miles E. by S. from Samboanguita point, is one mile in length north and south, and 300 feet in height; it is clear and steep-to, except on its western side, which is rocky.

Current.—In the channel between Apo and the coast of Negros, the current passes constantly from north to south with variable velocity.

Dumaguete point is a flat, salient point of sand, near which is the town of Dumaguete, the largest in the province, and containing 13,000 inhabitants, chiefly engaged in collecting turtle shell. Anchorage can be had off the town in a depth of 7 fathoms, but it is bad, as the beach is very steep-to, and vessels are liable to drag off into deep water.

TAÑON STRAIT, between Negros and Sebu, is 90 miles in length, 14 miles wide at the northern part, and $2\frac{1}{2}$ miles in width at the southern entrance. The shores are steep, and but little frequented.

EAST COAST OF NEGROS.—From Bito point, described at page 271, the coast trends south-eastward for 7 miles to Mokabok point, and is bordered by a reef which extends about a mile from it.

Bagunbanua islet is situated on the south-west part of a reef lying northward of Mokabok point, which extends $2\frac{1}{2}$ miles north-west and south-east; there is a detached rocky patch about one mile to the north of the main reef. The channel between the islet and the coast-reef is $4\frac{1}{2}$ fathoms deep, and is only fit for small coasters.

Danao river.—Between Mokabok and Okre points, which are both of yellow clay and steep-to, is the mouth of the river Danao with a depth of $2\frac{3}{4}$ fathoms on the bar at low water, and $5\frac{1}{2}$ fathoms up the stream.

Tiklin point, 19 miles S.S.W. $\frac{3}{4}$ W. of Okre point, is flat and covered by mangroves. On the northern and western sides of an islet north of Tiklin point, there is anchorage in $4\frac{1}{2}$ fathoms; there is no passage between this islet and the mainland. Tabon point, 3 miles southward of Tiklin point, is low and sandy; the sandy beach between the two points must not be approached closely.

Refugio island and anchorage.—Refugio island is about $1\frac{1}{2}$ miles long north and south, and one mile wide; the north part is high.

The eastern side is foul, and off the south-west part there is a small shoal, at the distance of about half a mile. The channel between Refugio island and the coast is about a mile wide, and affords good anchorage in a depth of 12 fathoms, mud; it can be entered from either end, but a wide berth must be given to the shoal off Tiklin point, and to the western point of Refugio.

Tidal streams.—North of Refugio the flood stream sets to the south-west, and the ebb to the north-west, but south of Refugio they set in the opposite direction.

Coal.—Layers of coal were discovered in this part of Negros in 1879, and outcrops of coal have been found in the rivers which enter the sea near the towns of Calatrava and Talabe.

Coast.—From Tabon point to Pauay point the coast is steep, clear, and covered by mangroves. Jilaitan point is steep-to. Pauay point is flat and sandy, with rocks on its northern side; there is anchorage in 3 fathoms to the southward of it before the little town and river Guijulugan. Between Guijulugan and Kateal a shoal extends to a short distance.

San José point is low, very steep, and surrounded by boulders; from this point to the Bais islands the coast is steep and clear.

Bais islands are two high islands surrounded by sand banks, which extend 2 miles to the north-east from both islands, and appear almost to fill the bight of the coast in which they are situated, between points Teka and Kanamay; both these points are foul.

Amblan point is flat, steep, and clear; not far from it is the town of Amblan, of 5,000 inhabitants, engaged in the cultivation of cacao. There is anchorage before the town in a depth of 4 to 13 fathoms, sand.

The southern entrance of the strait of Tañon is narrow, being but $2\frac{1}{2}$ miles in width; the shores are steep, and the tidal streams at springs reach a velocity of 5 to 6 knots, with strong races and eddies; at neaps the rate is 2 to 3 knots. For a fuller account of these tidal streams, see page 279.

BANTAYAN ISLAND, 8 miles west of the North point of Sebu island, is $10\frac{1}{2}$ miles long N.N.W. and S.S.E., and 4 miles wide. The highest part is near the centre of the eastern side, and is visible in clear weather at a distance of 18 miles.

Lauis point, the northern extremity is flat and sandy, and from it a rocky ledge extends 2 cables to the northward, with $3\frac{3}{4}$ fathoms off its end; hence the depth slowly increases to 9 fathoms at the distance of 2 miles. To the westward of the ledge, and not far from the town of Lauis on the point, small vessels can anchor in $2\frac{1}{2}$ fathoms, sheltered from the eastward by the ledge which breaks the sea.

See charts, Nos. 2,578 [2,648] and 2,577 [2,656].

From Lani's point the coast, sandy, and covered by mangroves, trends S.S.W. $4\frac{1}{2}$ miles to Patao point, the western extreme of the island; from this point a reef projects three-quarters of a mile, and borders the south-west coast, closing in to it again near the town of Bantayan, a place containing about 7,000 inhabitants, engaged chiefly in pearl shell fishing; only small coasters can approach it.

An extensive shoal spreads out to the south-west of Bantayan, on which are the nine islands called Dou; they are low and flat. The southern part of this shoal, and the southern coast of Bantayan, have not been surveyed.

The south-east point of Bantayan island, Ogton, is flat, and has a narrow fringing reef with a depth of 10 fathoms at its edge. The coast for 10 miles to the N.N.W. is sandy, and offers shelter from south-westerly winds where vessels can anchor in a depth of 5 fathoms. Jilantaguan islets, the largest of which lies $2\frac{1}{2}$ miles north of Ogton point, are steep-to; the channel between them and the coast is clear, but affords indifferent anchorage.

Guintakan island, midway between the north point of Bantayan and the northern part of Sebu, is 100 feet high, flat and wooded; its sides are clear and steep-to.

Shoal.—Nearly midway between Guintakan and Jilantaguan islets, there is a patch of $2\frac{3}{4}$ fathoms, with deep water in the channels on either side of it.

Malapascua island, situated 4 miles north-east of the north extreme of Sebu island, is $1\frac{1}{2}$ miles in length north and south, and half a mile wide; it is surrounded by a narrow reef which extends two-thirds of a mile south-westward from the south end of the island. On the east and west sides there are beaches of white sand, separated by rocky bluffs and mangroves. To the north and north-west of Malapascua, and close to it, are three very small islets. Vessels can anchor in a depth of 7 to 11 fathoms, sand and mud, in the channel that separates the island from Sebu; and also to the northward and eastward of the island.

Shoal.—A shoal of hard sand strewn with lumps of coral, 5 cables long north and south and 3 cables broad, upon which the least depth is $5\frac{1}{4}$ fathoms, lies situated with the south point of Malapascua island bearing N. 89° W., distant 3 miles, and Gato island N. 52° W. Deep water surrounds the shoal, which lies $1\frac{1}{2}$ miles eastward of the track for vessels recommended on the chart; a depth of 75 fathoms has been obtained between it and Malapascua island.

Chocolate island, one mile north of Bulalaki point, the northern extremity of Sebu island, is a small circular island one cable in diameter,

See charts, Nos. 2,577 [2,656] and 2,578 [2,648].

250 feet high, and conspicuous. It is wooded, clean and steep-to, with a depth of 7 fathoms close to its shore.

SEBU ISLAND.—Sebu island is of some importance and interest, as its port is open to foreign commerce. It is 120 miles in length in a N.N.E. and S.S.W. direction with a greatest width of 20 miles in the northern part. A chain of mountains traverses the island through its entire length, containing beds of mineral coal and, it is stated, veins of gold. The rivers are numerous but small, and generally unfit for either navigation or irrigation. With the exception of a few fine valleys, cultivation is confined mainly to the sea-board. The population of the island in 1899 was estimated by the Philippine Commissioners to be about 504,000; its area is 1,742 square miles. The chief exports are sugar, oil, hemp, tobacco, coffee, copra, and piña silk; the chief imports are European goods, coal, petroleum, salt, and rice.

WEST COAST.—**Bulalaki point** is lower than Chocolate island, rather steep, with a flat summit covered by trees, and presenting to the north and south some yellow patches. Vessels of all sizes can anchor in the channel between this point and Chocolate islet, in a depth of 8 fathoms, mud, near the islet, and $2\frac{3}{4}$ fathoms, sand, almost touching the point.

Kandaya point, the north-western extremity of the island, about $3\frac{1}{2}$ miles from Bulalaki point, is very low; a shoal of sand projects half a mile from it, and there is a patch of $2\frac{3}{4}$ fathoms at the distance of nearly 2 miles to the north-west. The coast between it and Bulalaki point shows sand beaches, off which there is good holding ground. The town of Kandaya, a poor place with about 1,000 inhabitants, lies S. by E. from the point.

The coast from Kandaya point is clear, with a depth of $4\frac{1}{2}$ fathoms off it to the town of Paypay, or old Bantayan, but thence to Kaut point a bank of $3\frac{1}{2}$ fathoms extends to half a mile from the shore.

Kaut point, 6 miles S.W. by S. of Kandaya point, is low and sandy, and is fringed by rocks and sand covered by $1\frac{1}{2}$ fathoms water, to the distance of 2 cables. Abundant fresh water is obtainable here from wells.

Jibitnil island, lying about a mile westward of Kaut, is $1\frac{1}{4}$ miles long north and south, and clear, ending to the south in a point of sand. In the passage between it and Kaut point the depth is from $4\frac{1}{2}$ to 25 fathoms.

Daijagon bay is surrounded by low shores covered by mangroves; the coast is foul, and the reefs extending from it reduce the available space to a width of one mile, in which there is anchorage in a depth of 8 fathoms. From the head of the bay a narrow, tortuous channel communicates with Bogo bay on the east coast, reducing the isthmus

here to a neck of land one cable in width, across which the natives pass their *barotos* to avoid going round by Bulalaki point. The canal is said to be filling up, and had a depth of 4 feet only in 1880.

Magtulinok point, forming the west side of Daijagon bay, is a narrow tongue of sand on which there are several little steep flat-crowned rocks; a shoal of 2 cables extent projects from its end.

Makao point is low, and clear on its north side, but from its south part a reef extends from before the shallow river Lambusan to half a mile from the shore, with a depth of 7 fathoms at its edge.

Jaligui river can be entered by small coasters through a passage of $3\frac{1}{2}$ fathoms between the reefs; the depth on the bar is 3 feet at low water. The northern point is of black rock underworn by the currents. The coast from Jaligui river to Tuburan river is bordered by a reef a quarter of a mile wide.

Batauan bay is very small, and the greatest depth inside is only 3 fathoms; the entrance points are higher than the rest of the coast in sight about this part.

Languyon point is low, clear, and steep-to, and offers anchorage on its southern side. Tuburan river is of no importance, and the bay is filled by a reef which extends round the western point to a distance of half a mile.

Buenabrigo point is low, sandy, and steep-to; on the northern side is a rivulet of good water, and on the south side there is anchorage sheltered from the north-east. Between Buenabrigo point and Balamban bay the shore is fringed by a reef which advances in one place as much as $1\frac{1}{2}$ miles. Balamban bay is foul and affords no accommodation.

Tajao point is low, clear, and steep-to, with a depth of 23 fathoms off it; vessels can anchor south of the point in 3 to 7 fathoms, sand. The tidal streams that enter Tañon strait from the north and from the south meet about off this point.

Tajao bank, 2 miles S.S.W. of the point, one mile long north-east and south-west and half a mile wide, is a bank of rock that uncovers at low water; there is no practicable channel between it and the coast. From Tajao point to Gorda point the coast is fringed by a reef which extends in some places to the distance of one mile.

Gorda point, the highest on the coast, is steep with a flat crown; there is a *vantay* on it.

Barili is a town of 17,000 inhabitants; the river leading to it has only 2 feet on the bar, and the creek at the entrance in which the depth is $2\frac{1}{4}$ to 9 fathoms, though a third of a mile wide between the points, is considerably reduced by reefs from both sides.

Dumanjok point is high, with mangroves at its base where a ledge extends 2 cables to the north-east, at a distance of 2 cables from which the depth is greater than 110 fathoms. The bay to the eastward has a depth of 17 fathoms at the entrance, lessening to 5 fathoms near the shore. A town of 600 inhabitants is at the bottom of the bay near a small river of good water.

Kopton point is low, of dark rock much underworn; it is surrounded by a reef half a mile in width, which quite fills up the bay to the eastward. The islet Pescador, $3\frac{1}{2}$ miles S.S.W. of Kopton point, is surrounded by dark rock, with no vegetation on it; its sides are steep-to.

Badian.—This town, which in 1887 had a population of about 7,400, can only be approached in boats at high water, as the wide bay in which it is situated is lined with salient reefs; there is no passage between these reefs and Badian island.

From Badian to the southern end of Sebu island the coast is clear, of moderate height, and so steep that anchorage can only be had very close to the shore in various places where there are towns.

Kolasi point is low, rather craggy, and white, with a telegraph station on it. From here to Liloan point, $3\frac{1}{2}$ miles to the southward, the coast is sandy and very steep, with rocks close to the shore.

The tidal streams are very strong off this point.

Liloan point the south-west extreme of Sebu, is sandy and steep, with some rocks, covered by $1\frac{1}{2}$ fathoms at a quarter of a cable from it. On the point is a stone fort, and a signal station which communicates with that at Kolasi. Vessels can anchor near the point in a depth of 7 to 14 fathoms, but the bottom is steep, and the tide streams run very strong. Between Liloan and Tañon points during flood tide an eddy current in the opposite direction passes very close to the coast.

South entrance of Tañon strait.—From Liloan point the coast trends E. by S. $\frac{1}{2}$ S. for $2\frac{1}{2}$ miles to Tañon point, and consists of sand-beaches with a depth of $5\frac{1}{2}$ fathoms close to. Tañon point is low and sandy, with a narrow ledge of rock projecting to the distance of one cable from it.

Tidal streams.—The flood stream from the strait of Surigao, passing westward between the islands Bohol and Sikijor, strikes the coast of Sebu at Dalaguete point, and divides into two branches, one turns north-west, and the other arm turning to S.S.W. meets with another part of the stream that was deflected from Negros island about Dumaguete point; the two, reunited, enter Tañon strait by the southern entrance with a velocity that reaches 5 to 6 knots during springs and 2 to 3 knots at neaps, with violent races and tide-whirls. The stream here flows north-

ward, lessening in force as the strait widens, until it reaches the parallel of Tajao point, where it meets the flood stream from the northward. At the northern entrance of Tañon strait the tide, even at springs, does not attain a rate of 3 knots. The ebb stream runs in a reverse direction from the parallel of Tajao point. As a resultant of the tides there is always, on the south-east coast of Negros between the points Dumaguete and Bombonon, a constant current to the south, with varying velocity.

EAST COAST of SEBU, from north to south.—Bulalaki point and Chocolate islet have already been described. From Bulalaki point to Bogo bay, 13 miles S.S.W., a reef of sand and rocks fringes the shore, and extends as much as $1\frac{1}{2}$ miles from it, at one place, about 3 miles south of Bulalaki; the depth at the edge of this reef is from 5 to 14 fathoms.

Bogo bay is nearly filled by shoals that extend from its sides, leaving only a narrow channel to the head of the bay where the town of Bogo is situated. The shoals are reported to show clearly, and to be marked by bushes. A very narrow neck of land separates Bogo bay from an inlet on the west coast of Sebu, across which the natives pass their *barotos* in preference to going round Bulalaki point.

Anchorage may be obtained in Bogo bay in bad weather, but vessels are recommended not to go into a less depth than 4 fathoms, as the water shoals rapidly, and the bottom consists of sand and rock.

Nailon point is low and surrounded by a narrow reef; the coast between it and Udlud point, which lies S. by E. $4\frac{1}{2}$ miles, is clear and steep-to, and consists of sand beaches interrupted by rocks and mangroves.

Udlud point is low and wooded, clear and steep-to. A range of hills lies 2 or 3 miles inland, which rises to an elevation of 1,858 feet above the sea W.S.W. of Udlud point.

Capitancillo islet, which lies east $2\frac{1}{2}$ miles from Udlud point, is low and circular in form, about a cable in diameter, with a few trees on it, and a sand beach on its western side; this side is clear, but on the northern side there is a narrow reef, and on the eastern and southern sides shoals extend to a distance of half a mile, with a depth of 18 fathoms close to the edge. At night Capitancillo resembles a *banca* under sail, and may be seen about 5 miles in clear weather.

At a distance of one mile N. by E. of Capitancillo islet is the southern end of a reef that stretches $1\frac{1}{2}$ miles N.N.E., upon which the least depth is $1\frac{1}{2}$ fathoms. There is deep water near its edges, and 22 fathoms in the channel that separates the reef from Capitancillo islet.

Between these dangers and the coast of Sebu there is a clear channel with a depth exceeding 55 fathoms.

Kalangaman islet, lying 12 miles N. 71° E. of Nailon point, is small and flat, and about 20 feet high; on its east and west sides are shoals which dry at low water. About a mile south-west of the islet is Nunez de Prado shoal about half a mile in extent, with a depth over it of $1\frac{3}{4}$ fathoms, and 14 to 18 fathoms round its edges.

Okmok shoal.—The Spanish steamer *Okmok* struck soundings in 2 fathoms in the channel between Kalangaman and Capitancillo islet. It being night no bearings were taken; the shoal is shown on the chart as lying 7 miles E. $\frac{1}{2}$ S. of Nailon point, position doubtful.

The channel between Capitancillo and Sebu is generally used by steamers.

Bantulin point, bearing S. $\frac{1}{2}$ E. 5 miles from Udlud point, is of uniform height, rocky, clear, and steep-to. To the north-west of the point is Tabagon bay in which there is anchorage in a depth of 4 to 9 fathoms, sand and mud, before the town of Tabagon. The shores of the bay are covered with mangroves, and must not be approached within one cable.

Coast.—From Bantulin point the coast trends S. by W. $\frac{1}{2}$ W. for $5\frac{1}{2}$ miles to Bugod point; it is low and steep-to, consisting of sand beaches separated by rocky bluffs which are surrounded by rocks to the distance of half a cable. The river Jimuguit enters the sea about 2 miles north of Bugod point; at the mouth of the river, very close to the shore there is a depth of 6 fathoms, sand.

Bugod point is low, rocky, and steep-to; the coast between it and Pinulakan point, $7\frac{1}{2}$ miles to the southward is of medium height, and consists of sand beach with anchorage off it. On this coast there are three towns: Bugod, of 3,000 inhabitants is on rising ground surrounded by hills: Sogod is very small: Kadmon contains a population of 5,400: the depth of water off this town is 6 to 22 fathoms, sand. Pinulakan point is of no great height, clear and steep-to. Luyan, to the south of it, is a town of 500 people, occupied in cutting wood, which is sent to Sebu.

Katadman point, which lies S. $\frac{1}{2}$ W. 21 miles from Bantulin point, is very flat and covered by mangroves; there is a signal station on it. A shoal surrounds Katadman point, extending from Danao river on the southern side, as far as the little port of Bugut on the northern side; on the outer edge of this reef there is a depth of 8 to 17 fathoms, sand and mud.

Port Bugut, or Karmen, is a small nook situated 3 miles N. by W. $\frac{1}{2}$ W. of Katadman point sheltered by the low islet Pupú. The eastern side of this islet is foul, and there is no passage between the northern side and the shore. The channel leading to the port is on the south side of the islet, and is reduced by shoals on both sides which are

awash at low water, and are marked by bushes. Within the port the depth is $4\frac{1}{2}$ fathoms, lessening towards the beach which is low and covered by mangroves. The town is on the south-west side of the anchorage, and consists of about 20 houses. In December 1879 two Spanish gunboats rode out a typhoon in this port.

Directions.—In order to enter the port the land should be closed to about a mile from the shore, care being taken to clear the reef that borders the coast, and when the fort at the bottom of the port bears W.N.W. a course should be steered for it on that bearing, which will lead clear of the shoals on either side. Without a pilot it would not be safe to attempt to enter at night.

Coast.—From Katadman point to Danao the coast is foul, and the anchorage off Danao, which is a large town of 13,400 inhabitants, cannot be recommended. From Danao to Bagakay point the shore is sandy, and, except about Dapdap point, where the water is shoal, offers anchorage in a convenient depth to vessels of all sizes during the south-west monsoon. Liloan, situated, on the left bank of the river of the same name, is small, and with the town of Dapdap only numbers 6,500 inhabitants; the river can be entered by *lanchas* at high water.

Bagakay point, bearing south 9 miles from Katadman point is low, ragged, and surrounded by rocks. When first seen from the northward the point makes as an island, there being a round-backed hill upon it about 150 feet in height.

LIGHTS.—On Bagakay point a *fixed white* light is exhibited from a circular tower 21 feet in height at an elevation of 46 feet above high water, which is visible in clear weather at a distance of 6 miles. The light-keeper's house is of nipa, and separated from the tower. The light is difficult to distinguish, the fishing lights in the vicinity being numerous and bright. For Maktan island light, *see* page 284.

Coast.—From Bagakay point the coast trends S.S.W. for $3\frac{1}{2}$ miles to the north-eastern point of a shallow bay within the entrance of the strait leading to Sebu. This entrance to the channel is marked by two buoys, lying (approximately) N.E. $\frac{1}{4}$ N. $1\frac{3}{4}$ miles and E. by N. $\frac{3}{4}$ N. $1\frac{1}{10}$ miles respectively from Bantolinao point, the north extreme of Maktan. On both sides of the entrance there are fishing stakes which serve to mark it.

SEBU PORT is formed by the channel which separates Maktan island from Sebu. The practicable channel is only one cable wide in the narrowest part, which is nearly abreast of Mandaui tower, and about $2\frac{1}{4}$ cables in width before the town of Sebu; the least depth in the centre of it is $4\frac{1}{2}$ fathoms, increasing in many places to 9 fathoms. The channel is marked along its whole course by a series of buoys, painted in vertical stripes:

those on the Sebu shore are black and white; and those on the Maktan side are red and white. The buoys must not be relied on, as they have been frequently out of place or away altogether; in their absence, the tide runs on the edges of the shoals, and the appearance of the water will indicate the passage. For probable change in colour of buoys, *see* p. 40. In daylight the navigation presents no difficulties, except on approaching Mandaui point from the north-eastward, when great care is needed in passing between a 2-foot rock situated E.S.E. distant $1\frac{2}{3}$ cables from the tower, and the shoal ground extending from the Maktan shore.

The towers of Mandaui on the Sebu coast, and of Opon, on Maktan island, are white; Opon tower, on a jetty projecting about 30 yards from the shore, and composed of coral blocks, is 30 feet high, and forms a good mark. The mud flat which extends north-east of Mandaui tower is covered with grass and is generally dry, but it is overflowed at times.

The town of Mandaui lies near the beach in the bight of the coast westward of the tower; it has a population of 10,500, who are chiefly engaged in sugar cultivation.

Between Mandaui point and Sebu point $3\frac{1}{2}$ miles distant, the coast falls back for three-quarters of a mile and forms a great bay, in which, with a general depth under 2 fathoms, there are a number of one-fathom patches, some of which are extensive. About $1\frac{1}{2}$ miles from Mandaui point are the Banilad Menor and Banilad Mayor rocks situated near the edge of the 3-fathoms contour-line, which dry at low water; they lie outside the limits of the navigable channel.

Maktan island consists of an old coral reef, raised a few feet (8 or 10 at most) above the present sea level. At the northern part of the island, where a convent stands, a low cliff fringes the shore, being an upper stratum of the upheaved reef. The raised reef is here preserved, but over the portions of the island immediately fronting Sebu it has been removed by denudation, with the exception of a few pillar-like blocks which remain, and which are conspicuous from the anchorage. The surface is scooped out into irregular basins and sharp projecting pinnacles, and covered in all directions with mud, resulting from the denudation. Nearly all the island is overgrown by mangroves, but on the part left dry there are plantations of cocoanuts.

From the northern point of the island near the entrance to port Sebu a ledge extends $1\frac{1}{10}$ miles to the N.E. by E., the edge of which is generally marked by fishing stakes, and the point of the reef by a red and white striped buoy. The north-west shore is fringed by a narrow reef, but on the south side the reef stretches out to 2 miles from the island, with depths of $5\frac{1}{2}$ to 8 fathoms at the edge. The north-east side is steep-to; the channel between Maktan and Olango island is $1\frac{1}{2}$ miles wide, clear and deep; *see* page 263.

The only town on the island is Opon, on the west coast, south-west of Mandaui point; the population amounts to 9,000, chiefly engaged in fishing and tending the salt-pans. It was here that Magellan was killed in 1521, after making the first passage across the Pacific.

LIGHT.—From an iron grey lighthouse 25 feet high, on Bantolinao point, the northern extreme of Maktan island, is exhibited a *fixed red* light, at an elevation of 39 feet above high water, visible in clear weather at a distance of 6 miles. The keeper's dwelling is near it. Pilots for Sebu harbour reside in the vicinity.

The town of Sebu is the most ancient in the Philippines; it is the seat of government of the Bisayan islands, which include Sebu, Bohol, Panny, Negros, and Leite; and it is the residence of a bishop. The town is built on a large plain at the foot of the chain of hills that traverse the island throughout its length, and is a well constructed, thriving place; the merchants' quarter includes some well built stone houses. The huts of the Malays, for the most part fishermen, are on the beach, and form the west part of the city. The fort is a triangular edifice of stone situated on a prominent point, off which is the anchorage.

LIGHTS.—From the south-east angle of Sebu fort a *fixed red* light is shown, visible at the distance of 2 miles in clear weather; it is reported to be a very inferior light. From near the top of St. Nicholas church, situated nearly a mile west of the fort, a *fixed white* light is exhibited, visible in clear weather at the distance of 7 miles; the light is not to be depended on.

Trade.—A considerable trade is carried on, the articles exported being chiefly hemp, sugar, and copra. The Danao coal mines have recently been sold to a German syndicate, who are preparing to work the concessions on a larger scale. The imported goods consist chiefly of rice, petroleum, salt, and coal.

The neighbouring islands of Leite, Mindanao, and Kamiguin possess extensive hemp plantations, a large proportion of the produce of which finds its way to Sebu for shipment.

In 1899 the imports were valued approximately at 217,000*l.*, and the exports at 856,000*l.*; in 1900, the values were 365,300*l.* and 573,500*l.* respectively. During 1899, 18,505 tons of hemp, and 13,194 tons of sugar were shipped at Sebu; in 1900, the quantities were respectively 16,088 tons, and 4,301 tons.

Supplies.—Provisions are plentiful, beef very bad, 12 cents per pound; fowls \$3 to \$3½ per dozen; eggs \$3½ per 100; bread 5½ cents, and vegetables 2 cents per pound; fruit plentiful; fish plentiful and moderate in price. Water, of good quality, is obtainable by boat at the rate of 30 cents for 20 gallons.

Coal.—The supply is very small; 1,300 tons were imported in 1899, but none was obtainable by H.M.S. *Pigmy* in February of that year. The coal station is at Kauit point, $1\frac{1}{2}$ miles south-west of the town; the coal is brought off in bulk, and the process of coaling is slow.

Communication.—There is a regular line of steam vessels running from Hong Kong to Sebu, by which imports of all kinds are brought direct from China, Europe, and the United States.

Telegraph.—Sebu is in telegraphic connection with Iloilo and Manila by submarine cable; also with Leite, Negros, Mindanao, and Sulu. See page 30.

Time signal.—See page 29.

Anchorage.—The best anchorage is S.S.W. of the fort in a depth of 5 to 7 fathoms, mud; nearer the southern reef there is deeper water, but the bottom is hard. Vessels should moor. A red mooring buoy for steamers unloading, lies 220 yards south-west of fort San Pedro light.

Tides.—It is high water, full and change at noon; springs rise 7 feet. The stream takes the direction of the channel and runs at the rate of about a mile an hour, but at springs its strength is 2 to 3 knots.

Southern entrance.—Kauit point is a tongue of sand, with trees on it, jutting out about 6 cables to the north-east from the coast, which has a rocky fringe on its eastern side; at its end is the ruin of a former castle which now has the appearance of a remarkable rock. At high water it appears as a low islet, and is not distinguishable until close-to. The remains of the old castle lies S.W. $1\frac{1}{2}$ miles from Sebu fort. Between Kauit point and Lipata point, which lies S.W. $\frac{1}{2}$ S. 2 miles from Kauit point, the shore is sandy, off which anchorage may be taken.

Campanario shoal, covered by one foot of water, lies about half-way between Kauit castle ruins and the eastern edge of Lipata bank; it is marked by a buoy. From it St. Nicholas church bears N. 13° E., and Kauit castle N. 6° E., distant 9 cables.

Lipata and Narvaez banks.—Lipata bank lies in the middle of the southern entrance to port Sebu, between the coast of Sebu and the reef off the south-west point of Maktan island. It is of oval form, $3\frac{1}{2}$ cables in length N.E. by E. and S.W. by W., $1\frac{1}{4}$ miles wide, and uncovers about one foot at low water. Lipata Menor, upon which the least depth is $3\frac{1}{2}$ fathoms, lies $1\frac{1}{2}$ cables east of the northern end of the above bank; it is marked by a buoy, striped black and white. Between Lipata bank and Lipata point, is Narvaez bank, of coral, 2 cables long, covered by one foot of water. Both these banks, as also the edge of the reef off Maktan island, are sometimes marked by fishing stakes, but as the stakes are being constantly shifted, too much confidence must not be placed in them as marks for the edge of the banks.

LIGHTS.—On Lipata bank a *fixed red* light is exhibited from a tripod elevated 42 feet above high water, and visible in clear weather at a distance of 6 miles. This light is not to be depended on in bad weather with southerly winds.

On Lanis point, the south-west extreme of Maktan island, a *fixed green* light is exhibited from a tripod elevated 36 feet above high water, and visible at a distance of 6 miles. The light-structure is about 6 cables within the extremity of the ledge extending from Lanis point. Some houses near the lighthouse are occupied by the lightkeeper, and by pilots for Sebu harbour.

Leading mark.—The dome of St. Nicholas church bearing N. $\frac{3}{4}$ E. will lead in mid-channel between Lipata bank and the reef off Maktan. On this bearing the church is in line with the central apex of a triple-peaked hill situated 10 or 12 miles northward of the town. St. Nicholas church, dark coloured and standing amongst trees to the left of all the other churches, is not conspicuous. Sebu cathedral tower kept just open eastward of the city hall (a large square white new building) will also lead in from the southward, in a depth of 5 fathoms.

Lipata point is flat and sandy; about one mile W.S.W. from it is the village of Talisay.

Lagundi shoal, with a least depth of $2\frac{1}{4}$ fathoms, lies S.W. by W. $\frac{1}{4}$ W., distant $2\frac{1}{2}$ miles from Lipata bank light-beacon.

Bogo shoal, having over it a depth of $2\frac{1}{4}$ fathoms, lies S.W. $\frac{3}{8}$ W., distant about $1\frac{1}{4}$ miles from Lipata bank light-beacon, and about one mile from the shore at Talisay.

Osteng shoal, a small patch of $4\frac{1}{2}$ fathoms, lies a quarter of a mile westward of Bogo shoal.

Lanis point, the south-west extremity of Maktan island, is a ledge projecting about $1\frac{1}{2}$ miles from the coast line, and two-thirds of a mile beyond the light-structure; it forms the east entrance point of Sebu harbour, and is marked by a buoy.

Tambon shoal, covered by a depth of 4 fathoms, is in reality the edge of the ledge extending southward from Maktan island; its outer face bears S.E. by E. $\frac{1}{4}$ E. about $2\frac{1}{2}$ miles from Lipata bank light-structure, and is marked by a buoy with a staff and ball. None of the buoys are to be depended upon.

Directions for navigating from Jintotolo channel to Sebu.—From a position 2 miles south of Jintotolo a course of S.E. by E. $\frac{1}{2}$ E. will lead $1\frac{1}{2}$ miles outside of north Gigante and north of (but close to) Tanguingui islet, to midway between Malapascua and Chocolate islets, but allowance must be made for the set of the current which varies according to the strength of the monsoon. In the day time Malapascua can be passed on either side, but at night it is advisable to pass to the eastward, giving a berth to the dangerous reef which extends about three-

quarters of a mile off its south point. From Malapascua a course should be steered to pass between Capitancillo and Kalangaman islets; a S. $\frac{3}{4}$ W. course then leads to within 2 miles of Bagakay point, at the northern entrance to port Sebu; or, from Malapascua steer to pass between Capitancillo and the coast of Sebu, as the channel that separates them is clear and deep, and is to be preferred.

The narrowest part of the channel to port Sebu lies E.S.E. of Mandaui tower (*see* page 282), and a vessel should keep on the Maktan side to avoid the bank on the coast of Sebu, and the 2-feet rock off Mandaui tower. When the *Challenger* entered the port in 1875 the edges of the shoal were by no means readily distinguished, for muddy water extended right across the narrowest part of the channel.

Having passed Opon a vessel should steer, in daylight, S.W. by W. towards Sebu point, keeping it a little on the starboard bow; at night, the *red light* upon the fort will show its position. This course will clear the Banilad and other shoals on the Sebu side and lead about 2 cables from the shore coral ledges of Maktan island, to the anchorage off Sebu.

To leave the anchorage by the southern channel a S.W., course should be steered until the dome of St. Nicholas church bears N. $\frac{3}{8}$ E., when a course S. $\frac{3}{8}$ W. leads through the fairway between Lipata bank and the ledge of Lanis point. Having cleared the ledge and Lipata bank a course can be steered to pass westward of Kabilao island.

South-east coast. — From Lipata point to Tinaan point S.W. by W. $\frac{1}{2}$ W. 6 miles, the coast forms a bay in the centre of which is the town of Minglanilla, of 9,700 inhabitants; the entire bay is obstructed by shoals which extend to $1\frac{1}{4}$ miles from the shore; the channels amongst these shoals, and between them and the coast, have a depth of less than 3 fathoms.

Naga is a large town of 12,000 inhabitants, with a handsome church. Steam vessels and coasting craft make Naga when approaching the south entrance to the port of Sebu.

Anchorage, but of small extent, may be obtained off Naga in a depth of 4 to 7 fathoms, but care must be taken to avoid a small sunken rock covered by $2\frac{3}{4}$ fathoms water, which has a depth of 9 fathoms within a boat's length of it.

Tinaan or Tuiaan anchorage, situated about $1\frac{1}{2}$ miles south-west of Naga, in front of a small village (without a church) difficult to distinguish, is protected by a shoal which lies half a mile south-east of the village. This shoal is 6 cables in length E.N.E. and W.S.W. and 2 cables wide; its extremities and the points of the bay are marked by stakes. In the middle of the bay there is a depth of 11 fathoms, sand, lessening gradually to $2\frac{3}{4}$ fathoms at one cable from the wharf. The north entrance

is easier and cleaner than the south entrance, in the middle of which there is a patch of $5\frac{1}{2}$ fathoms. Tinaan is the port of shipment of coal from the mines of Uling and Alpako.

Coast.—From Tinaan to the salient point of Argao, the coast is fringed by a narrow reef which extends from it in places to a distance of about 2 cables; it is very steep with a depth of more than 50 fathoms at a short distance from it. In passing along this part of the coast of Sebu it is advisable to give the land a moderate berth.

San Fernando is a town situated about 4 miles south-west of Tinaan, and some distance inland.

Karkar point and bay.—The point is low and fringed by coast reef 2 cables in width, with depths of 20 to 40 fathoms near it. The bay has an islet in its centre, which, with the shoals projecting from the shore forms a little sheltered port. The town of Karkar contains about 30,000 inhabitants, and its church is situated conspicuously on a hill N.N.W. of the islet. The entrance channel to the port lies eastward of the islet, runs north-west and south-east, and has a depth of $4\frac{1}{2}$ to $6\frac{1}{2}$ fathoms; within, the depth is 7 fathoms. The best anchorage is near the north part of the islet. An acquaintance with the locality is necessary, as the sides of the entrance are not marked by bushes; the shores are low and covered by mangroves.

Sibonga, 4 miles south of Karkar bay, affords good anchorage sheltered from westerly winds, in a depth of 4 fathoms, sand, at equal distance from the court-house and church; northward of this position the bottom becomes rocky, as is also the coast hence to Karkar bay. The town of Sibonga contains about 14,000 inhabitants.

Argao point, 8 miles south of Sibonga affords anchorage in a depth of from 4 to 7 fathoms, sand, sheltered from north and north-east winds. Small vessels load here in both monsoons, choosing their anchorage north or south of the point as most convenient. The town in 1887 contained 23,116 inhabitants; the church is a most conspicuous building. Supplies may be obtained at Argao by applying to the local authorities.

Dalaguete point, 9 miles S.S.W. $\frac{3}{4}$ W. of Argao point is flat and sandy, clear and steep-to. Anchorage may be obtained north or south of the point in, respectively, $3\frac{1}{2}$ or 18 fathoms sand. The town of Dalaguete contains 19,250 inhabitants, and may be known by a conspicuous church visible at a great distance. The coast between points Argao and Dalaguete, consists in some places of clean and steep sand beaches, and in others of mangrove patches with shoals extending to a distance of one cable from the shore.

Tidal streams.—The flood stream from the eastward strikes the coast about this part of Sebu, and is divided into two streams which follow

See chart, No. 2,578 [2,648].

the coast—one to the N.N.E. through the channels on either side of Maktan island, the other to the S.S.W. passes round the south end of Sebu, and enters Tañon strait. The course of these streames is more fully described further on; see page 296.

The coast from Dalaguete point to Boljo-on is low, with steep sand beaches interrupted by rocky bluffs. Between these places are the town and shoal of Mambagi; the shore before the town is clean, with a depth of 12 fathoms off it.

Mambagi shoal, of sand and rock, is one-third of a mile long, and a little more than a cable wide, with depths of $3\frac{1}{2}$ to 11 fathoms round its edges. It lies about one mile off the coast and $2\frac{1}{2}$ miles N.E. by N. of Boljo-on bluff.

Boljo-on bay is small and very steep, there being a depth of 12 fathoms within half a cable of the shore. A little to the north of the bay is a white peaked rock of a good height, Boljo-on bluff, on which there is a little stone tower, used as a signal station. The town of Boljo-on is surrounded by a wall and fortifications.

Yuisan point, $4\frac{1}{2}$ miles south of Boljo-on is low, and ends in sand and rocks close to the shore; the village contains 350 inhabitants.

Yuisan shoal, of sand and rock awash at low water, and with depths of 2 to $5\frac{1}{2}$ fathoms round its edge, is 2 cables in extent, and lies $1\frac{1}{2}$ miles off the shore, with Yuisan church bearing N.N.W.

Oslob point, 3 miles southward of Yuisan point, is sandy and low, and is fringed by reef to the distance of a cable; it has on it a fort of white stone, visible at a considerable distance. On the south side there is anchorage in a depth of 4 to 9 fathoms. The town of Oslob in 1887 numbered about 5,600 inhabitants. The coast between points Yuisan and Oslob is sand beach fringed by reef a quarter of a mile wide, steep-to. From Oslob point to Tañon point which lies south-west $8\frac{1}{2}$ miles from it, the coast land is high, with sandy beaches and rugged bluffs of white rock, and is very steep.

Tañon point, the southern extreme of Sebu island, is low, sandy, and surrounded by reef a little more than a cable wide. There is anchorage south of the point in a depth of $5\frac{1}{2}$ to 7 fathoms, sand; but it is exposed to the force of the tidal streams that enter and leave the strait of Tañon. The church and town of Tañon are on high ground near the point.

Sumilon island lies E.N.E. 3 miles from Tañon point, and $1\frac{1}{2}$ miles off the coast. It is two-thirds of a mile long, and 150 feet high; its shores are clean and steep-to.

See chart, No. 2,578 [2,648].

BOHOL ISLAND is of oval figure, 47 miles in length north-east and south-west, and 30 miles wide, with an area of 1,439 square miles; the southern part is hilly and rocky, but the northern part has good tracts of level ground. The height is about the same as that of Sebu, the culminating point being mount Kopton, near the north-east extremity, which attains an elevation of 10,150 feet. The coasts of Bohol are bordered by reefs, which on the northern and north-west sides of the island extend to a distance of about 12 miles.

The productions of the island are cacao, tobacco, cotton, Manila hemp, rice, maize, and sugar-cane; and its forests furnish excellent wood. The district of Bohol includes the island of Sikijor and Panglao, which in 1899, according to the Philippine Commission, contained about 248,000 inhabitants; the seat of Government is at Tagbilaran on the south-west coast.

Lapinin island, on the north-east extremity of Bohol island, is separated from it by a narrow channel in which the depths are from $3\frac{1}{2}$ to 6 fathoms; the island is 8 miles long, flat, and covered by brambles, and a narrow, steep coral reef surrounds it. The islet Tinuibo, lying S.E. by S., $2\frac{1}{2}$ miles from the northern point of Lapinin island, is small, clean, and steep-to. Between the islands there is a depth of 12 fathoms.

North coast of Bohol.—**Danajon bank** forms the outer limit of the coral reef that borders the north coast of Bohol, and is composed of a great number of shoals and islands, between which only small vessels with a good local pilot can navigate. The eastern end of the bank, sometimes called Adam and Eve bank, lies 10 miles N.E. $\frac{1}{2}$ E. from the north point of Lapinin island, and 2 miles from the coast of Leite.

The bank has two openings through it; the north-eastern channel is in a line between mount Kopton in Bohol, and mount Three Peaks in Poro island (Kamotes); and the western opening lies N. 60° W. of mount Corte; both of these openings have a width of about a mile, and a depth of 8 fathoms. On the bank, at great intervals, there are small islands covered by bushes and mangroves.

To pass through the north-eastern channel, stand in on the line joining Himukitan and Nanu islands, N.E. $\frac{1}{8}$ E., and S.W. $\frac{1}{8}$ W.; this line passes close to the reef extending westward from Bilanbilangan island, off which, however, there is a sufficient depth of water. A small fishing hut is situated on a low sand bank on the western side of the passage. The line joining mount Three Peaks and mount Kopton crosses the first line in the middle of the channel.

Channel between Bohol and Leite.—**Kauigao island**, which divides the channel between Danajon bank and the coast of Leite into two passages, lies $1\frac{1}{2}$ miles from the coast of Leite; it is half a mile long,

and is surrounded by a shoal which extends 2 miles S.W. by S. from the south coast of the island, and three-quarters of a mile from the northern end. Of the two passages the eastern, between Kanigao and Leite, is the better; it is about three-quarters of a mile wide, and has a depth of 7 fathoms in mid-channel. The passage between Kanigao and the limits of Adam and Eve bank is not well known.

Adam and Eve bank.—This rocky patch, upon which there is a depth of $1\frac{1}{2}$ fathoms, with 3 fathoms around, lies with the centre of Kanigao bearing N. 86° E., and Tinuibo islet S. 23° W.

Carmen shoal, on which the steamship *Carmen* was wrecked, lies about 4 miles S. by W. from Kanigao islet, and one mile off the west coast of Leite.

Islands and reefs.—No detailed description of the numerous islands and reefs that encumber the large space lying between the Danajon bank proper, and the north coast of Bohol can be given, but the following information may be found useful.

Midway in the channel between the north coast of Bohol and Mahanay island, and directly south of the centre of the latter, is a coral reef about 50 feet in extent, covered by 5 feet water, which is steep-to, and surrounded by a depth of 10 fathoms; when the sun is shining it may be discerned at a distance of $1\frac{1}{2}$ cables, showing as a reddish brown spot. With the exception of this reef the passage between Mahanay and Bohol is practicable for vessels of about 16 feet draught. The main channel runs south of the small islet south-east of Tambu island, where a depth of $3\frac{1}{2}$ fathoms may be carried at low water. Eastward of Tambu island there is a depth of 5 fathoms until directly south of Saae island, where it shoals to $2\frac{1}{2}$ fathoms. By keeping within the distance of $2\frac{1}{2}$ cables from the fish weirs on the north coast of Jau island, this depth at low water may be carried through to Maumaun island.

There is no passage to the northward between Saae island and Sagasay island, except for small craft drawing under 6 feet; the bottom here is very irregular, strewn with large boulders, and the depth is nowhere greater than 2 fathoms at high water. The tide here is uncertain in height, and the tidal streams are of great strength.

Northward of Maumaun island, a depth of 4 fathoms may be carried, but a vessel must be careful to keep well to the eastward of Sagasay, from which island reefs extend eastward one mile. There is a reef awash at the distance of about one mile S.E. $\frac{1}{2}$ S. from Nanu island. Good anchorage may be had in a depth of 6 fathoms, at the distance of about $2\frac{1}{2}$ cables directly south of Nanu.

If proceeding southward, a depth of 3 to 4 fathoms can be carried by a vessel passing a quarter of a mile westward of Makaina island and the small islet to the north of it. There is a reef, covered with 2 fathoms,

See chart, No. 2,578 [2,648].

situated half a mile south-west of Makaina. Reefs project some distance eastward from Tabiki point, and the depth is only about one or 2 feet at low water between the point and Jau island.

The water along the Bohol coast is muddy, the bottom being seldom visible in a depth greater than $1\frac{1}{2}$ fathoms. The reefs generally show reddish brown in the sunlight, and are difficult to distinguish from cloud shadows; an occasional reef shows up white, like that south-west of Makaina island, but these are the exceptions.

North-west and West coast.—Jandayan.—Vessels of about 16 feet draught can find anchorage off Jandayan, near the north-west point of Bohol, between the village and the island to the northward, in a depth of from 4 to 7 fathoms mud. Narrow reefs extend from both the mainland and island, but the anchorage may be safely approached by keeping midway between them.

Olango island, situated north-west of Bohol, is low and flat, $4\frac{1}{2}$ miles long north-east and south-west, and 2 miles wide at its southern part, which is the widest. A steep reef surrounds it, extending half a mile from the eastern and western shores, and 4 miles to the south-west, with several islets on it. The channel which this island forms with Maktan is $1\frac{1}{2}$ miles wide—deep and safe—and is often used in preference to Sebu strait. The channel east of Olango, between that island and Danajon reef, 2 miles in width, is also practicable and deep.

Malikabok and Bagambanua islands.—These little islands, which lie 7 miles off the coast of Bohol, may be said, with their surrounding reefs, to terminate to the south-west the great Danajon bank, from which Malikabok is separated by a deep channel one mile wide. A detached shoal with $2\frac{1}{2}$ fathoms on its western edge, lies S.W. 2 miles off Bagambanua, and between these islands and the coast of Bohol are numerous islets and shoals, which will not be described—their positions are best seen by reference to the chart.

Kalape island, lying near the coast, is of no great height; it is foul and surrounded by a steep reef. The little port of Kalape, the entrance to which is very difficult and dangerous, is between the island and the coast.

Kabilao island, separated from the coast islands Kalape and Sandingan by a wide and deep channel, is $2\frac{1}{2}$ miles long east and west, and $1\frac{1}{2}$ miles wide. On the south-west side it has a small reef; the western side is rocky, rugged, and steep; the northern and eastern sides present sand beaches and rocky bluffs.

Tidal streams.—The flood stream makes to the northward, and the ebb to the southward with great force.

Laon point and town, or the point of the mole, is terminated by a sand beach, on which is a rampart; it is foul and surrounded by great detached rocks. The mole is 328 yards long, and the town is reached by steps cut in the rock. Between this mole and Sandingan island is a little bay, where sheltered anchorage may be had from winds between North and S.E., in a depth of $3\frac{1}{2}$ to 9 fathoms, mud. The town, of about 12,200 inhabitants, is situated on the western slope of the Kanmanok hills at a good height, and presents from the sea a very picturesque aspect; it is defended by a fort with bastions at the angles.

Cruz point, $4\frac{1}{2}$ miles south of Laon point, of no great height, is rocky and underworn, and presents the appearance of a wall. A ledge extends 2 cables from it with a depth of 11 fathoms at the edge.

Maribojok bay, in the elbow which the coast forms east of Cruz point, is foul, and lined by a steep reef extending three-quarters of a mile before the river Abatan, and continuing along the coast until it joins the reef of Panglao island. The town of Maribojok, in the centre of the bay, is on ground of slight elevation, and numbers 16,500 inhabitants.

Shoal.—At 3 miles south-east of Cruz point and at one mile from the coast there is a small shoal of 33 yards extent surrounded by a depth of 27 to 36 fathoms at the distance of a cable.

River Abatan.—The mouth of this river is of good width and there is a depth of $5\frac{1}{2}$ feet on the bar at low water; the bar is generally marked by stakes. The north point is flat, and covered by mangroves, and has a reef off it; the south point has a little rocky islet off it, covered by mangroves. The town of Paminuitan, on a little hill near the sea, contains 5,160 inhabitants.

PANGLAO ISLAND is low and flat, having only one little hill on it; it is almost joined to Bohol island, as the channel that separates them dries at low water; a reef extends off it nearly 4 miles to the south-west. There is no anchorage off the island, the reefs being steep-to. Duljo point, the western extreme, is sandy and flat, but clean and steep-to; it may be recognised at a distance by a group of cocoanut palms. Bolud point is flat and sandy, with a fort upon it. Bikuin point is steep with a flat crown.

Balिकासag island, lying S.S.W. $\frac{1}{4}$ W. distant $4\frac{1}{2}$ miles from Duljo point is small, flat, clean, and steep-to. The channel between it and Panglao island is deep, no bottom being found in it with 110 fathoms. In taking this channel it is better to keep near Balिकासag.

Cervera rock is 2 cables in extent, and has 13 feet, coral and sand, on its shallowest part. It can be distinguished in daylight by the colour

See chart, No. 2,578 [2,648].

of the water. From the rock, Tahuruk point (Panglao island) bears N.W. by W.; the mount at the north-east end of Panglao, N. $\frac{1}{4}$ E.; and the north extreme of Pamilakan island, E. $\frac{3}{4}$ N.

Pamilakan island, lying E. by S. $\frac{3}{4}$ S. distant $9\frac{1}{2}$ miles from the south point of Panglao, is of no great height, and its coast is foul. The natives of Bohol resort to it to fish *bêche de mer* and turtle.

Tagbilaran strait is of little importance, as it dries at low water, and can only be navigated by vessels drawing less than 6 feet. The entrance is from the westward, and is generally marked by stakes. The town of Tagbilaran contains about 7,600 inhabitants, engaged in agriculture and turtle fishing.

The south coast of Bohol may be approached with safety, as the reef that fringes it is narrow and very steep; the little bays at the mouth of the rivers on this coast afford no good anchorage. The towns of Loay and Dimiao contain each about 8,000 to 9,000 inhabitants. From Napakao point, to Agio point the coast appears clear and steep.

Jagna.—Small vessels may find anchorage off the town of Jagna, in a depth of 7 fathoms, but the holding ground is not good.

Guindulman bay, situated westward of Napakao point, is of considerable extent, and is bordered by a reef with deep water close to it; westward of some islets and rocks in the north-east corner of the bay there is a patch of 3 fathoms, with a depth of 23 fathoms just outside it. The town of Guindulman, containing about 8,500 inhabitants, is at the head of the bay, and southward of it there is good anchorage for vessels of any size in depths of from 4 to 10 fathoms, mud and sand.

Buckingham shoal.—The *s.s. Buckingham*, drawing $12\frac{1}{2}$ feet, aft, when proceeding between Bohol and Kamiguin islands (1893), touched and immediately passed over some obstacle, apparently a rock, situated approximately in lat. $9^{\circ} 30' N$, long. $124^{\circ} 28\frac{1}{2}' E$.

Kobton bay, to the northward of Namanuko point is filled by a reef which leaves only a narrow opening 5 cables wide between the islets Lumitis and Tabon. This reef, which begins a mile to the southward of Namanuko point, continues to the northward as far as Lapinin island, bordering the coast at a short distance from it; the edge is steep, with depths of 5 to 9 fathoms near it.

Shoals.—A narrow reef, three-quarters of a mile long N.N.W. and S.S.E., with but half a fathom water over it, and a depth of 7 to 13 fathoms close to, lies 4 miles N. $\frac{2}{3}$ W. from Namanuko point, with Lumitis island bearing W. by S.

A circular shoal of sand and rock, a little more than one mile in diameter, and covered by $1\frac{3}{4}$ fathoms, lies 7 miles north of Namanuko point; close to its eastern edge the depth is 37 fathoms.

There is also a small circular shoal, almost awash at low water, with a depth of 11 fathoms on its eastern edge, which lies south-east of Tintiman islet, and N. 30° E., distant $1\frac{1}{2}$ miles from the point between Tintiman islet and Libas point.

A third small steep-to shoal, dry at low water, is situated in the little bay, south of Tintiman.

Tintiman island affords good anchorage inside of it, in a depth of 5 fathoms.

SIKIJOR ISLAND, $14\frac{1}{2}$ miles in length east and west, and 11 miles wide, is very broken on its surface, and rises to a central peak; mount Kudtingun, at the north-east part of the island, is 1,394 feet high. The productions are tobacco of superior quality, rice and maize, though hardly sufficient for local consumption, manila hemp, and good cacao, which is bartered for wax. The population is about 20,000.

Sandugan point.—The northern part of the island is low, and surrounded by reef one cable in width; a conspicuous little hill lies near Sandugan point. The coast from Sandugan point to port Kanoan, 3 miles to the south, is foul, but steep near the shoals.

Port Kanoan is small and the only port of refuge in the island; its whole extent is but 6 cables, and a sand flat at the head which dries at low water reduces the available part of it to 4 cables. From the northern point of entrance a reef extends $1\frac{1}{2}$ cables to the westward, with a depth of $4\frac{1}{2}$ fathoms at its edge, and skirts the north side of the port; the southern entrance point, and south side of the bay are bordered by a reef one-third of a cable wide. The depth at the entrance is 14 fathoms, lessening to $3\frac{1}{2}$ fathoms off the mole. The town, which is on the south side, contains a population of 6,800.

Tidal streams.—Off Sandugan point the tidal streams are very strong; the flood runs to the west, and the ebb to the east; but on the north-west coast of Sikijor there is an eddy stream in the contrary direction, which does not extend 2 miles off from the shore.

Tongo and Pasigajon points are low, and surrounded by a reef which advances in some places as much as a mile from the shore. This reef is difficult to see, and is dangerous to approach; the depth exceeds 110 fathoms at the distance of one cable from its edge. **Makapilay point** is clean and peaked. With the exception of this reef on the west coast, the shores are clean and steep-to. On the south side the water is reported to be very deep near the shore, but no soundings are shown on

See chart, No. 2,578 [2,646], and plan of port Kanoan, No. 949 [2,659].

the chart. Lasi bay is clear but deep; Minalutan bay is almost closed by a reef.

Shoal.—Off the north-east coast, 2 miles north of Dakit point, there is a small bank of rock, of uncertain depth, with very deep water around it. From this shoal mount Kudtingun bears S. 66° W., and Lumango point N. 58° W.

CURRENTS.—In the eastern parts of the Sebu sea, between the south point of Panaon island and the north point of Kamiguin island, there is a constant current to the westward in both monsoons varying in strength according to wind and tide. Vessels approaching Surigao strait from the westward should keep well over towards Panaon island to avoid being swept by the current towards Kamiguin island.

In the southern part of the sea, on the north coast of Mindanao, there appears to be hardly any tidal stream, and the currents follow the direction of the wind in both monsoons.

There appears to be a constant current to the southward between Sebu and Bohol islands, and between Negros and Sikijor. When the *Challenger* was at Sebu it was noticed that the ebb, or south-going stream, immediately following the moon's superior transit, ran with far greater strength than either of the other two tides; the velocity at its greatest strength was 2 miles an hour. On leaving Sebu a current of 2 miles an hour was experienced. This current would appear to be by no means uncommon during the north-east monsoon, for Captain Riches of the British ship *Glamorganshire*, who happened to be at Sebu at the time of the *Challenger's* visit, and who has had much experience amongst the Philippine islands, said that he had always failed in attempting to work northward in this channel. On one occasion he struggled against wind and current for six days without making a mile, and eventually bore up and went round Negros and Panay islands, and came to Sebu from the northward in four days from the south end of Bohol. In March 1884 the German barque *Jupiter* left Iloilo for Sebu, and endeavoured to pass west of Sikijor, but had to bear up and work up on the east side. It would be better for sailing ships to work up on the north coast of Mindanao, and make Bohol east of Sikijor island.

Tidal streams.—The current produced by the tidal wave that enters by the strait of Surigao and passes between the islands Panglao and Sikijor divides into two branches. The northernmost flows to the north-west and strikes against the south-east coast of Sebu, about Dalaguete point, spreading its waters north and S.S.W. along the coast, so that a vessel off Dalaguete point has the flood favourable for going to Sebu, or to enter the strait of Tañon. The stream that flows N.N.E. passes through the channels between Sebu and Bohol, and con-

cludes its course 5 or 6 miles south of the Kamotes islands, where it meets the opposite flood tide coming south between the northern part of Sebu and Leite. The ebb tide sets in the reverse direction.

The second branch flows to the westward, and striking the coast of Negros off Dumaguete divides into two other arms, one of which enters the strait of Tañon with great force, while the other turns south between Sikijor and the coast of Negros until, off Bombonon point, it meets the flood entering from the Sulu sea, and the united waters take a south-easterly direction towards Silla and Tagolo points in Mindanao.

LEITE.—The island of Leite, one of the Bisayas, is generally mountainous, but it contains however several large and fruitful valleys. The prevailing geological formation is volcanic, and several of the mountains are the extinct craters of volcanos, in which are found sulphur and other products of volcanic action; gold and iron ore are also found in the island. The mountains are covered with forest, among the trees of which is that which yields *damar*, the *brea* or pitch of the Spaniards, for the production of which Leite is the most remarkable of the whole Philippines.

The climate of Leite, though hot, is healthy; hurricanes occur, and inflict great damage to the cocoanut trees. The rivers are small and unfit for navigation, but are extensively applied to irrigation. The chief productions are *abaca* (manila hemp), cotton, rice, and sugar cane, and the principal industry is the extraction of cocoanut oil. The area of the island is 2,713 square miles. The population in 1899, according to the Philippine Commission, amounted to about 270,500. The capital, Takloban, is on the eastern coast near the southern entrance of the strait of San Juanico, that separates Leite island from Samar.

Communication.—Leite is connected with the general telegraphic system by submarine cable to Sebu; *see* page 30.

THE WEST COAST of LEITE is in general safe and steep-to; the fringing reefs do not extend more than a mile from the shore. A chain of high mountains runs parallel to the coast at a distance of 4 to 5 miles inland; the highest peak of this range appears to be mount Sacripante, 3,911 feet, in the south-west part of the island.

Gigantangan island, off the north-west point of Leite, is 2 miles long N.N.E. and S.S.W., and one mile wide; it is clear on all sides except the south point, where there is a small reef. The channel that separates it from Leite is one mile in width, and has in it a depth of 11 to 16 fathoms.

Bays.—There are two small bays, distant about $7\frac{1}{2}$ miles south of Gigantangan, separated by a tongue of land, in which the depth is 7 to 11 fathoms. Isidro (Tabin Chico) bay, and Arévalo (Tabin Grande) bay, with towns of the same names at their heads, situated respectively 3 and

5 miles south of the above mentioned small bays, are each about a mile wide at the entrance and enter the land for the distance of about 2 miles; the former bay has a depth of $4\frac{1}{2}$ fathoms, but Arévalo bay appears to be quite shallow. Tabango and Kampopo bays, separated by Liglo point, and Siland bay are other small indentations on this coast still further to the south. The narrow reef that fringes this part of the coast follows the contour of these bays.

Port Palompon is formed by a narrow channel between the coast south of Kanauayan point, and the reef on which is situated the island Tabok; the only entrance is to the northward between the point and the island, the southern end of the channel being closed by low reefs covered by mangroves.

Kanauayan point is bordered by a reef to the distance of $1\frac{1}{2}$ cables, and the reef of Tabok island extends W.N.W. three-quarters of a mile from its north point; reducing between them the width of the passage to 2 cables, in which there is a depth of 19 fathoms. Proceeding inwards, the passage becomes narrower and shoals gradually, so that in front of the church, where there is the best anchorage, it is hardly a cable wide; here the depth is 7 fathoms. Anchorage can also be had close to the sandy point, alongside which vessels of any size can lie secured to the shore. From this point the channel continues to contract, and the depth to decrease until off Gumalak island, where it is only $2\frac{3}{4}$ fathoms. The reefs show at low water, and the edges are marked by poles with bushes on them, but these must not be relied on.

The town of Palompon is on the shore of the port, and in 1887 numbered about 5,800 inhabitants. Supplies of beef and vegetables may be obtained; also fresh water. In the town of Palompon, as in other of the towns of the Philippine islands, a tariff of prices is hung up in the Casa Real for the guidance of strangers, who can claim to be supplied for ten days at the prices quoted.

Directions.—To make the port of Palompon, Kalangaman island should be brought to bear N. 64° W., when a course S. 64° E. will lead for the entrance.

Coast.—The reef that surrounds Tabok and Gumalak islands and fringes the shore to a distance of $1\frac{1}{2}$ miles, continues to the southward round Duljugan point where it is half a mile wide, to port Dupon which lies 2 miles eastward of the point. Duljugan point is low and thinly wooded; the south-western point of port Dupon is somewhat higher and has a little fort on it.

Port Dupon has a depth of 23 fathoms in the centre; the best anchorage is on the western side of the port where the shore is less steep than on the east side, and where there is more shelter; on the east side the bottom consists of coral, and the anchorage is considered very unsafe.

See plan of Port Palompon, No. 957 [2,646], and chart No. 2,578 [2,648].

The little bay of Siapon, $1\frac{1}{2}$ miles to the eastward, is sheltered from all winds, but those from south to south-east; the depth at the entrance is 14 fathoms, lessening gradually inwards. The low point between the two bays may be distinguished by a patch of *cogonal* on it. Water can be obtained in both bays.

Kalunangan point is low, flat, and bordered by a narrow reef. Anchorage can be had on the coast between Kalunangan point and Biasong point in a depth of 9 fathoms, coarse sand.

ORMOK BAY.—To the eastward of Kalunangan point the coast forms the great bay of Ormok, in the north-west part of which is the fishing village of port Bello, and good anchorage during both monsoons in a depth of 3 to 9 fathoms, mud. This is said to be the only safe anchorage on the south coast of Leite island during the generality of typhoons.

Bao river is a stream of some size with 5 feet on the bar at low water and a greater depth within. From the eastern bank of the river a clean sandy beach with good depth off it stretches $1\frac{1}{2}$ miles to the south-east as far as the town of Ormok.

Ormok is a town of 13,300 inhabitants, situated near the shore and on the slope of mount Aslum. Two buoys, painted black, 3 cables apart, mark the submarine cable leading from Ormok anchorage; the outer buoy bears S.W., and is distant 5 cables from the church.

Peaks of Aslum and Kampukan.—Mount Aslum rises to a high and remarkable peak, N.E. by E. $4\frac{1}{2}$ miles from Ormok town. Kampukan peak, 2 miles N.E. of Aslum peak, is much higher and more conical than that of Aslum. Both mountains abound in sulphur and copperas.

Coast.—From Ormok to Baybay, a town of 11,400 inhabitants, lying about 23 miles to the south-eastward of Ormok, the shore is low and consists of steep sand beach with depths generally of 14 to 18 fathoms very close to it. From Baybay to Hilongos, 19 miles to the southward, the coast forms rocky headlands alternately with small clean and steep bays.

It is reported that there is a good typhoon anchorage in the bay immediately south of Baybay, in from 6 to 10 fathoms, inside a shoal that lies off the village of Pumpangan, where there is a wharf. A noticable hill is said to mark the head of the bay.

KAMOTES ISLANDS.—This group consists of three islands connected by a reef, and one small detached islet, Talong. The westernmost island, Pasijan, is $8\frac{1}{2}$ miles long, north and south, and 5 miles wide; it is clean and steep-to all round except that part of the eastern side where a reef that nearly dries at low water joins it to Poro island. Talong island, off the northern end, appears clean and steep.

Poro island is surrounded on all sides except the north-western by a reef of less than half a mile in width, the channel between Poro and Ponson has a depth of 5 to 7 fathoms, and is practicable for navigation. The town of Poro is on the south side of the island; and anchorage may be had off the town at the distance of half a mile; but caution must be observed in approaching, as shoal ground that dries at low water runs out a long distance.

Ponson, the easternmost of the group lies $5\frac{1}{2}$ miles S.S.E. of Kalunangan point; the channel between the island and point is clear and deep, but care must be taken not to approach the shore off Ponson as a reef extends northward of it to the distance of about one mile.

Tidal streams.—The flood stream from the northward passes from west to east in the channel between Ponson island and Kalunangan point and curves round the island to the southward. The flood stream from the southward which has entered by Surigao strait, meets the flood stream from the northward about 5 miles south of the Kamotes group.

Cuatro isles (Four islands) is the name given to a group of four islets lying 3 to 6 miles off the coast of Leite, westward of mount Sacripante, which attains an elevation of 3,911 feet. The southernmost island, Himukitan, bears W.N.W. about 4 miles from a little steep hill with a flat crown on the coast 6 miles north of Hilongos; this islet and the one 3 miles north-west of it (Mahaba) are both clear and steep-to, the two others are surrounded by reefs. The passages between these islets and between them and the coast are safe.

COAST.—From Hilongos the coast forms an elbow which falls back 3 miles towards the town of Bato and then continues to the southward for $11\frac{1}{2}$ miles to Green hill (Verde) point, opposite Lapinin island.

Shoals.—Off the village of Matalom, $2\frac{1}{2}$ miles south of Bato, is a shoal, having over it from $2\frac{1}{2}$ to 5 fathoms. A submerged rock is reported to lie off Green hill at the distance of a quarter of a mile from the shore.

Carmen shoal, on which the steamship *Nuestra Senora del Carmen* was wrecked in 1891, lies one mile westward of the point immediately north of Green hill, with Kanigao islet bearing N. by E., distant 4 miles.

From Green hill the coast trends eastward 6 miles to the town of Masin, and then turns S.E. $\frac{1}{2}$ E. for 13 miles to Tuankan point the south extremity of the island of Leite. All this part of the coast is formed of rocky points and small sand beaches; and is clean and steep-to except before the town of Masin, and also around Tuankan point.

Masin is a town of about 14,400 inhabitants, situated on a sand beach from which a ledge projects some 2 or 3 cables and dries at low water; a channel with a depth of $2\frac{3}{4}$ fathoms leads to the town. There is anchorage southward of the town in a depth of 6 to 14 fathoms, sand.

Tuankan point is low, and is formed of rock underworn by the current, giving it the appearance of a rampart. It is surrounded by a reef extending about $2\frac{1}{2}$ cables southward, with $4\frac{1}{2}$ to 9 fathoms at the edges, and a depth exceeding 92 fathoms at the distance of one cable.

Eastward of Tuankan point the coast turns abruptly to the northward, forming an extensive gulf about 21 miles in length and from 3 to 7 miles wide, about which there is no information, but it appears to be deep, clear of danger, and its shores steep-to. There is anchorage at its north-eastern extremity off the town of Mak.

Limasana island, situated 2 miles to the south-east of the southern point of Leite, is $4\frac{1}{2}$ miles in length north and south, and one mile wide, and has a remarkable hill on its northern part. The island is clean, and on its south-east side there is a sandy beach, off which anchorage can be had in a depth of $2\frac{3}{4}$ fathoms at the distance of one cable from the shore. The channel between Limasana island and Tuankan point is safe.

Tidal streams.—The tidal streams run with great force here, the flood stream to the N.W. and the ebb to the S.E.

PANAON ISLAND, separated from the south-east point of Leite by a narrow channel, is $17\frac{1}{2}$ miles long N.N.W. and S.S.E., and 5 miles wide at its northern part. The island is mountainous and is divided throughout its length by a range of hills terminating to the south in a mountain 2,313 feet high, the slope of which forms the southern point of the island.

The eastern coast is high and rugged, and shows several cascades of excellent water. The western coast, though steep, presents several sand beaches, off which anchorage may be had in a depth of 7 to 9 fathoms, sand, but it is better to anchor in the sheltered port of Liloan at the north end of the island.

Port Liloan has two entrances; that from the eastward is very narrow, with a least depth in it of $2\frac{3}{4}$ fathoms, increasing to $4\frac{1}{2}$ and $5\frac{1}{2}$ fathoms in Panoan strait. The water in it is so clear that the bottom can be distinctly seen. In approaching the port from the eastward, steer for the narrow opening between Leite and Panoan island, which runs in a W. by S. $\frac{1}{2}$ S. direction, and at a good distance off a group of cocoanut palms on Liloan point will be seen. The depths increase on nearing the entrance; when a depth of 15 fathoms is obtained keep in the middle of the channel, and coast along the shore reef of Panoan until in front of the town where there is anchorage in $5\frac{1}{2}$ to 7 fathoms, sand.

Entering from the westward, steer for a little hill near Liloan point, with cocoanut palms and some houses on it, taking care to clear the reef

extending north-westward from the entrance point, near which the depth is 26 fathoms; close the sandy point of Panoan, however, as near as prudence admits to avoid the coast of Leite from which the shore reef projects $3\frac{1}{2}$ cables to the south-west. The channel between the edge of the Leite reef, and the sandy point of Liloan is $3\frac{1}{2}$ cables wide, and in it the depth is 7 to 9 fathoms.

The shores of the port are sandy, and the town of Liloan is situated on a little plain. The population amounts to about 6,000, who are chiefly engaged in agriculture, fishing, and gold washing.

Tides.—The tides in Panoan strait are stated by Horsburgh to run with exceeding great strength.

SURIGAO STRAIT.—Surigao strait is famous for having been traversed by Magellan when he crossed the Pacific Ocean and discovered the Philippine islands. The strait is now less frequented than that of San Bernardino, which is more to windward in the N.E. monsoon. It is, however, more direct and safer than that strait, but it obliges vessels that take it if they are making for Manila, to work up the west coast of Negros and Panay, and the east coast of Mindoro. It is of advantage to vessels going to the southern Philippines or to the Sulu sea.

The main strait is safe and deep throughout its length, and the shores of the islands that border it are steep-to. Steamers from the Sebu sea making for ports on the east coast of Mindanao may find it advantageous to take the eastern passage between Dinagat and Bukas islands and the main coast of Mindanao. This channel will be described after the main strait.

SOUTH-EAST COAST OF LEITE.—From Panoan strait the coast trends north $5\frac{1}{2}$ miles, then turns abruptly to the east for another $5\frac{1}{2}$ miles to Malagusan point, a rounded headland formed by the eastern slopes of mount Kabalian, which is 3,130 feet high; the coast-line then continues north again for $8\frac{1}{2}$ miles to Hinunangan bay. Throughout this entire length the coast is high and clean, with deep water in the vicinity.

Hinondayan bay is very small; an islet surrounded by rocks lies at the mouth; the depth of water in the passages on either side of the islet is 11 fathoms, and within it is $3\frac{1}{2}$ fathoms.

Hinunangan bay has a depth of 15 fathoms in the middle, and $5\frac{1}{2}$ fathoms off the town of the same name, which stands on the left bank of the river Malaga at the head of the bay. The two islands Kabugan lie in the northern part of the bay, separated from the main coast (which is sandy) by a channel one mile wide and 15 to 25 fathoms deep.

Jinatungan point lies 11 miles north of Hinunangan bay, and is bordered by a reef which extends out half a mile. A rocky islet and several rocks lie immediately south of the point at the distance of three-quarters of a mile from the shore.

Taytay point, 10 miles north-west of Jinatungan point, is also surrounded by a reef to a distance of half a mile. From the point the coast trends north for 30 miles to the southern entrance of San Juanico strait. All this tract of coast consists of sandy beaches with a good depth of water off them; there are many rivers, and several towns standing along the shore. The country inland is level and covered with dense wood interspersed by cocoanut plantations and rice fields.

The south coast of Samar is described in Chapter IX.

NORTH-EAST COAST OF MINDANAO AND OFF-LYING ISLANDS.—**Bilaa point**, the northern extremity of Mindanao island, is the termination of the range of hills that runs along the eastern coast from north to south; the point itself is of dark rock, clean and steep-to.

A sand-bank of $1\frac{1}{2}$ miles extent, covered by $2\frac{1}{2}$ fathoms, lies north three-quarters of a mile from Bilaa point, from which it is separated by a deep channel half a mile wide; vessels using the channel should pass between a quarter and half a mile from the shore. During the south-west monsoon, anchorage can be found on the slope of this bank in a depth of 27 fathoms, sheltered from the tidal streams.

Madilao point, which lies south-west about 3 miles from Bilaa point, is high, clean, steep, and composed of dark rock; no bottom was found with 92 fathoms at the distance of one cable from it. It forms, with Bilaa point, a bay running about one mile in, which offers anchorage, sheltered from north-east to south-west through east. The coast, on the western side of Mindanao, as far south as the river Butuan, is little known but it appears to be safe and steep; it consists of the western slopes of the two mountain ranges.

North-east coast.—From Bilaa point the coast trends E.S.E. for 4 miles to the river and town of Surigao, and consists of sand-beaches and rocky cliffs, clean and steep-to.

Surigao town, the residence of the governor of the district, stands on the shore on the right bank of the river; it contains about 5,100 inhabitants engaged in collecting pearl shell and trepang, and in gold washing. The anchorage off Surigao is not good, but if intending to anchor off the town, it should be brought to bear S. by W., and steered for on that bearing, and the anchor let go in 12 fathoms at the distance of one or $1\frac{1}{2}$ miles from the shore. It is better not to anchor further out, as the

depth increases rapidly to 35 fathoms and more, and the tidal streams reach a velocity of 8 knots.

Earthquakes.*—On the 1st of July 1879, owing to a succession of earthquakes, the ground in the neighbourhood of Surigao and Bilanbilan in Mindanao island, sank two feet. In October 1879 pilots would not anchor vessels off the town of Surigao in a less depth than 15 fathoms, and at that time all the government and most of the heavy buildings were uninhabitable.

Mails from Surigao to places on the east coast of Mindanao island are sent to Butuan, a town situated on a river of that name on the north-west coast, and thence across the mountains to their destination.

Tides.—The tides are affected by diurnal inequality, both as to time and height, in the same way as at Manila. The time of high water at full and change, is, approximately, 9h. 30m.; springs rise $6\frac{1}{2}$ feet, neaps $4\frac{1}{2}$ feet.

Bilanbilan anchorage.—The little creek named port Bilanbilan, lying one mile south of Surigao, is protected from all but easterly winds, but is only large enough to take one moderate-sized vessel, and hardly capable of holding four small coasters. These latter anchor south of the point in a depth of about 7 fathoms, but in the open bay to the eastward there is anchorage in 9 to 11 fathoms, sand, close to the reef which borders the mangrove-hidden shore. A stake with lantern on it marks the end of shoal water on the northern point. A good road connects Bilanbilan and Surigao.

Basol island, lying 3 miles N.E. by E. $\frac{1}{2}$ E. of Bilaa point, is flat and bordered by a sand-beach; a reef surrounds the island, and extends 4 cables to the south-west. Midway between Basol and the coast, the depth is 25 fathoms. The force of the tides is very strong in this channel, where they form violent eddies and whirls.

Onate rock, a pyramid 10 yards in diameter, covered by 5 feet, and surrounded by very deep water, lies about a mile N.E. $\frac{1}{4}$ N. of Basol island and from it the middle of Sumilon island bears N.W. $\frac{3}{4}$ N.

Belzibub rock is a small steep coral bank lying about one mile north-east of Onate rock. This rock and Onate divide the channel between Basol and Gipdo island into three passages of about equal width.

Sumilon island, $5\frac{1}{2}$ miles N. $\frac{3}{4}$ E. of Bilaa point, is small, low, and steep-to. The currents are more dangerous near this island than in the vicinity of Basol, and there is always an ocean swell.

* These earthquakes may have caused alterations affecting the features as shown on the charts, which should therefore be used with caution.

See plan, No. 962 [2,662], and chart, No. 2,578 [2,648].

Satan's rock, one mile N.E. by E. $\frac{1}{2}$ E. of Sumilon island, is small and steep; it may be approached close to on the east side.

Gipdo island off the south-west end of Dinagat island, is 1,030 feet high, steep-to and clean on all sides except at its south-east point from which a reef extends to a distance of half a mile.

Danaodanauan island, about one mile N.W. of Gipdo, is safe and steep-to; a reef lies off its north shore.

The Kabilan islets are a group of four, situated $2\frac{1}{2}$ miles E.N.E. of Danaodanauan, and occupying an area half a mile in extent. A small sand-bank lies between these islets and Dinagat town.

The Unip group, lying about 5 miles north of Gipdo, is composed of the islands Sibanok, Unip, Kabakian, and several islets. The southern and western sides of the group may be coasted at a short distance without danger.

DINAGAT ISLAND is $36\frac{1}{2}$ miles long, north and south, and $12\frac{1}{2}$ miles across its widest part; a chain of mountains traverses the island along the east coast, the northern peak, mount Redondo, reaching the height of 3,337 feet. The coasts are in general bold and steep-to. On the western side of the southern end there are two islands almost forming a part of the main island, being separated from it by a narrow channel only. A conical hill, 1,060 feet in height, rises in the southernmost of these two islands. The town of Nonok is situated at the southern end of this island, and half a mile south of this southern point there is the flat islet Rasa, surrounded by and connected with it by a rocky reef; Rasa forms the northern side of the eastern passage of Surigao strait.

Sibale island is connected with the western side of the northernmost of the above two islands by a reef, and is separated from Gipdo island by a narrow deep channel.

Gipdo passage, which separates Dinagat from the two islands to the south-west, is $1\frac{1}{2}$ cables wide and 6 fathoms deep throughout its length. The southern entrance is at port Gabó, and the northern is about 3 miles south of Dinagat town; about the middle of this passage another channel branches off from it to the W.S.W., separating the two islands.

Dinagat town, of 1,200 inhabitants, is built upon a point from which foul ground extends, on the south side of an unimportant creek which has a depth of 37 fathoms at the entrance. The main industry is the extraction of gold from a mine in the neighbourhood.

The west coast of Dinagat from the islet Kubkub, which is clean and steep-to, runs north for 15 miles as far as Esconchada point, and can be coasted with safety; about half-way lies the town of Liboho, in a bay of no importance, open to the north-west. The Pelotes rocks,

which extend from the south point of the bay, half-way across the entrance, are steep-to; a clean and steep islet, not named on the chart, lies one mile south-west of the south point. To the northward of Esconchada there are two bays, separated by Berrugosa point. The Twins islets lie 2 miles N.N.E. of Berrugosa point.

Gibuson island, 4 miles north-west of Berrugosa point, is 3 miles long, north-west and south-east, narrow, and of irregular shape, clean, and steep-to. It can be passed without danger at a distance of one mile.

Malinao port, on the east coast of Dinagat, 13 miles from the north point of the island, is a narrow little bay penetrating to the distance of 2 miles, with a depth of 18 fathoms decreasing to $2\frac{1}{2}$ fathoms. The entrance points are bordered by reefs; that surrounding the north point extends along the coast northward for a distance of 4 miles.

Peñascales point, 10 miles S. by E. of Malinao port, is surrounded by rocks to the distance of half a mile.

Port Gabó, situated at the south end of Dinagat island, is well sheltered, being protected to the northward by the high mountain Cabaliete, and to the south by mount Lapa, on the island south-west of Dinagat. The port, which is easily made out from seaward, is 9 cables wide at the entrance, and has a good depth of water. It penetrates $1\frac{1}{4}$ miles to the westward, and then forms an elbow turning into the Gabó passage. The anchorage is at the elbow at the distance of one cable from the sand beach, and 3 cables northward of the islet joined to the southern shore, in a depth of 12 fathoms. Water can be procured from the north shore of the port.

Malhon island, which lies N. by E. $\frac{1}{2}$ E. 16 miles from the north end of Dinagat, and is distant 10 miles from the south-east point of Samar, is a crescent-shaped island, 8 miles long, of moderate height, with a small islet, Mantuna, near the western point. In the bay on the north-east side there is a sand beach with rocks on both sides of it, and a depth of 14 fathoms near. E.N.E. of this sand-beach, and in the direction of Suluan island, there are rocky patches of 12 fathoms, with a depth of 35 fathoms close to.

Suluan island, 9 miles east of Malhon island, and 10 miles S.E. $\frac{3}{4}$ S. from the south point of Samar, is nearly one mile in length, of moderate height, and steep-to, with several rocks on its western side. Situated as it is to windward at the entrance of Surigao strait and being conspicuous, it is a good point to make for when approaching the strait from the Pacific. Between Suluan and Malhon islands the depth is generally about 12 fathoms, and between Suluan and the edge of the reef off the south point of Samar 16 to 23 fathoms, sand.

See chart, No. 2,578 [2,648], and plan of port Gabó, No. 962 [2,662].

EASTERN or GUNTUAN PASSAGE.—This narrow and tortuous passage is comprised between the north-east coast of Mindanao and the south points of the islands Dinagat and Bukas; although deep, it should not be taken without a pilot, on account of the strength of the currents and the tide-whirls met with off the south end of Dinagat. In case of necessity vessels can anchor at Surigao to wait a favourable wind and tide.

Pilots may be obtained at Surigao; and should the vessel be bound for ports in the Pacific, they can be landed at Kantilan, which is a large village on the north-east coast of Mindanao, where supplies can be procured. Applications should be made to the captains of the Pueblos. In 1897 the charge for pilotage through Surigao strait was 30 dollars, but it is advisable to arrange terms for the payment of pilotage beforehand. Vessels entering Surigao strait from the eastward can pick up a pilot from Kantilan.

NORTH-EAST COAST of MINDANAO.—Surigao town and Bilanbilan bay have already been described. From the east point of Bilanbilan bay the coast trends almost S.E. by E. for 30 miles, forming a slight indentation, to Tugus point; the shore is covered by mangroves and strewn with rocks.

The Guntuan islands extend to about 9 miles from the coast in a north-easterly direction, leaving a deep channel $2\frac{1}{2}$ miles wide between them and the south coast of Dinagat. Guntuan island, the largest of the group, is 3 miles long north-west and south-east, and has a small islet off its northern point; both island and islet are clean and steep-to. Bayatnan, the next island to the westward, is $3\frac{1}{2}$ miles long north-west and south-east; a reef on its northern end extends one mile to the north-east, enclosing several rocks under water. The channel between Guntuan and Bayatnan is $1\frac{1}{2}$ miles wide; but some islets off the southern end reduce the available passage to a width of 4 cables. This channel can be used by steamers, but the passages between the western islands of the group and the coast of Mindanao are not practicable. Kabsugan, the southernmost island, is 4 miles long north-west and south-east, and is united to the coast.

Nagubat islets are two rocks, clean and steep-to, lying 7 miles south of the summit of Guntuan island.

NOTE.—The islands between Mindanao and Dinagat are reported to be incorrectly charted.

Kabgan island lies $2\frac{1}{2}$ miles south of Nagubat islets, and one mile from the coast of Mindanao. A group of four rocks lies $2\frac{1}{2}$ miles south-east of Kabgan.

Nangaba islands, close to Tagonito point, form a chain of eight islets extending $4\frac{1}{2}$ miles W.N.W. and E.S.E. The southern islet, Amagadpagat, lies nearly in the middle of the channel between the coast and the south point of Bukas island.

Tugas point is a narrow tongue of land stretching 2 miles to the north-east. The channel between it and Bukas island is 4 miles wide, and has a depth of 40 fathoms in the middle. The land in the vicinity is commanded by mount Legazpi, 3,889 feet high, at the northern end of the great range that runs parallel to the east coast of Mindanao.

Ballena (Whale) rock, $6\frac{1}{2}$ miles east of Tugas point, when seen from the northward, appears like two rocks; it is 5 yards in extent and 5 feet above water; a reef extends half a mile south-west from the rock.

General island is the largest and highest of a group consisting of three islands and several rocks lying off Kapunuypugan point, 5 miles south-east of Tugas point. It is separated from the point by a deep and narrow channel, and is surrounded by a reef which shows several rocks above water, and includes Triton rocks and Aukwi islet 2 miles to the south-east. There is anchorage south-west of the island near the shore in a depth of 17 fathoms, mud. Unamao, 2 miles south of General island, is united to the coast by a reef; between the two islands there is an isolated rocky shoal.

Kantilan reef, before the river and town of the same name 5 miles south of Kapunuypugan point, extends 2 miles from the shore; the end of the reef is in line with Unamao islet and Kapunuypugan point.

Kauit point, 20 miles S.E. by E. of Tugas point, has a reef extending north-eastward from it for a distance of fully 5 miles; the open bay between the General islands and this point has not been sounded. The coast reef, with a breadth of from one to $1\frac{1}{2}$ miles, continues to the southward from Kauit point for the distance of about 10 miles.

Tides.—The ebb stream from Surigao strait is said to follow round Kauit point to the southward.

BUKAS ISLANDS are two islands so close together as almost to form one, but they are separated by a narrow opening in the reefs that surround them. The western island, or Great Bukas, is irregular in outline, about 12 miles long north and south, and traversed throughout its length by a range of hills. Its coast on all sides, except the north-eastern where it is joined to the eastern island, is clean. A small shoal of white coral lies about 4 cables E. by N. from the north end of this island. There are depths of 11 to 18 fathoms about one mile from the south-west coast, in the channel between the island and Tugas point.

The eastern Bukas island, also irregularly shaped, is 6 miles in length from east to west, and 3 miles across at its widest part; it is surrounded by a coral reef which projects 2 miles to the south-east, and incloses the islet Kasulian; the reef is steep-to and shows several rocky heads above water. A conical hill, 984 feet high, rises on the southern part.

Port Sibonga, at the south-western end of the eastern island, at the foot of the conical hill, is divided into two narrow arms by an islet united to the island by a reef that borders the shore. The depth of water in the western arm is 9 to 18 fathoms, sand and rock; in the eastern arm it is 4 to 9 fathoms. This latter arm is said to communicate with port Castilla on the north side of the island by a channel 15 yards wide and 5 feet deep, but no indications of a passage appear on the chart.

Port Castilla (not named on the chart), an indentation between the reefs on the north sides of the two Bukas islands, is open to the northward by a narrow passage between the reefs; it is a little oval-shaped port, 6 cables in length and 3 cables across, in which there is a depth of 8 fathoms.

Reef.—A narrow reef, extending 8 miles N.E. $\frac{1}{2}$ E. and S.W. $\frac{1}{2}$ W., which dries in places, lies 3 miles south-east of the eastern Bukas island. The north-eastern extremity of it is separated from the south-east reef of Siargáo island, by a passage nearly $1\frac{1}{2}$ miles wide, and the south-western extremity is separated from the east coast of the western Bukas, by a passage 2 miles wide. These passages, as also that between the reef and Kasulian islet, are safe and deep.

Lajanosa and Anajauan, are two islands lying about 8 miles south of Siargáo island, and east of the west Bukas island. They are two miles apart, and surrounded by reefs; some rocks lie one mile south of Lajanosa. The passage between Lajanosa and the reef south-east of Siargáo is 4 miles wide, and has a depth of 18 to 23 fathoms.

SIARGÁO ISLAND is irregular in outline, 19 miles long north and south, with 12 miles greatest width at the southern part, and is traversed throughout its length by a chain of mountains. The northern and north-western coast is surrounded by an extensive reef to a distance of 3 miles from the shore; and from the south-east part of the island another reef projects to a distance of 4 miles, enclosing the islets Guinjang and Dako. On the coast there are a few towns, and some little ports entered by channels through the reefs. On the western coast between ports Sapao and Kakub there is a group of low islands on a reef, and several rocks show at various points on the edge of the reef.

Port Pilar, on the east coast of Siargáo, is a small circular port 6 cables in diameter, steep sided, with a large rock on the southern side

See chart, No. 2,578 [2,648], and plan of port Sibonga, No. 962 [2,662].

united to the coast by a reef; the anchorage is west of this rock in a depth of 8 to 14 fathoms.

Dapa channel, between Siargáo, and Bukas island, is safe and deep; its least width between the island off Kambasag point, the south-west point of Siargáo, and the north coast of east Bukas, is one cable; the reefs on both sides are distinctly visible.

Kiko and Barrabas shoals lie in the middle of the western entrance. The first is one cable, and the other $1\frac{1}{2}$ cables in diameter; they are steep-to and can be passed on either side. The reef off the north point of great Bukas island has already been mentioned.

Dapa reef extends $1\frac{1}{2}$ miles E. by S. from Kambasag point. On the reef and close to the point there is an islet 6 cables long; an opening in the reef, 3 to $5\frac{1}{2}$ fathoms deep, leads to the anchorage of Dapa. A detached bank surrounded by deep water lies $2\frac{1}{2}$ cables east of Dapa reef.

Dapa anchorage is in a narrow channel between the northern edge of Dapa reef and the shore reef of Siargáo; it has a depth of $3\frac{1}{2}$ fathoms before the town of Dapa, an unimportant place of 1,200 inhabitants. Neither pilots nor supplies are obtainable. The inlet north-west of Dapa is obstructed by reefs, and only fit for boat navigation.

Port Kakub, on the south-west coast of Siargáo is only half a cable wide at the entrance, but has a depth of $3\frac{1}{2}$ to 12 fathoms; there is anchorage before the port in 7 fathoms. The coast between Dapa inlet and Kakub is a mass of rock, dry at low water.

Port Sapao, on the north-west coast, is formed by an opening in the reef and is of no importance.

Jalian island, $6\frac{1}{2}$ miles N. 60° E of the south-eastern point of Dinagat island, is surrounded by a reef which extends 2 miles to the E.N.E.; the eastern edge of this reef is $2\frac{1}{2}$ miles distant from the western edge of the north-west reef of Siargáo.

TIDES.—In port Kakub there are two high tides and two low tides each day. The height of the tide is affected by diurnal inequality, which varies with the moon's declination. In the summer the day tide is the highest and in the winter the night tide. It is high water, full and change, at 6h. 22m.; springs rise 7 feet, neaps 5 feet.

Tidal streams.—In Surigao strait the flood tide sets to the west, and the ebb to the east, the latter following round Kautit point then runs to the southward.

The velocity of the stream in the strait reaches a rate of 6 knots at springs. There is a difference of about 2 hours between the time of high water at Surigao and in Surigao strait. Fishermen roughly estimate that

when the moon rises the ebb tide commences to run in Surigao strait. From January to June there is but one high water during the twenty-four hours in Surigao strait, which occurs during the night. From July to December the same phenomenon takes place, but the time of high water is during the day.

From observations made by the Spanish surveyors, it appears that the highest tide on the west coasts of the islands of the strait takes place at the same hour as the lowest tide on the east coasts. This phenomenon is especially marked at the little island Kabsugan, south-west of Guntuan, the inhabitants of which live by shell-fishing; and when the banks of the east coast begin to cover they pass to the west coast, where the tide begins to fall, and continue their fishing.

Eddies.—Between Surigao and Bilaa points a counter current prevails, contrary to the direction of the tidal stream in the strait, and between the coast of Mindanao and the islands Dinagat and Siargáo a number of eddies prevail in different directions. The pilots of the locality avail themselves of these eddies in navigation.

Winds in Surigao strait.—At the mouth of the strait the N.E. monsoon commences towards the end of September, and blows throughout October and November; in December, N.E. winds alternate with northerly gales. In January, winds blow from N.E. and E.N.E. accompanied by heavy rain. In February and March, easterly winds prevail. In April, May, and June, the prevailing wind is S.E., with occasional gales called *collas* from the south. In July, August, and September, *collas* from S.W. are frequent.

The N.E. winds, though strong, cease during the night; but winds from the S.E., south, and S.W. continue to blow. It generally rains with N.N.E. and E.N.E. winds; the rain ceases and the weather clears with east winds, and more so with S.E. winds. With S.W. winds it remains clear unless a gale arises which sometimes brings rain.

In general there is no very bad weather in this part of the Archipelago, except when a typhoon occurs. The season of the year when typhoons mostly occur is from the end of October to the beginning of January, principally at springs and at the quarterings of the moon, it is said. They begin to blow from N.W. and finish from the S.E. having passed through either north-east or south-west; when they veer through north-east they blow the stronger, and more rain falls.

According to Maqueda, in the year 1775 three typhoons occurred in Surigao strait, and two in 1781, at the crescent and full moon. None have been observed since that time, whilst in the mouth of San Bernardino strait, and the coast of Luzon, several very severe typhoons have been recorded.

DIRECTIONS for the EASTERN PASSAGE.—The eastern passage between the north-east coast of Mindanao and the islands of Dinagat and Siargáo is difficult, and should not be taken by a sailing-vessel unless she has the wind and tide in her favour. A pilot should be employed, and the route taken should be as follows: Having made Bilan point a vessel can either pass outside the $2\frac{3}{4}$ -fathoms shoal north of the point, or between it and the point; and she should keep in mid-channel between Basol island and the coast of Mindanao. When one mile south of Basol, the vessel should steer about S. 70° E. to pass one mile from the rocks that surround Rasa islet off the south point of Nonok, but the Mindanao coast must be given a sufficient berth in passing it; then steering E.N.E she should pass between Guntuan island and port Gabó, rather approaching the Dinagat shore which is steep-to, and where she will be less exposed to the tidal streams and eddies which are very violent in this passage. Guntuan island should be rounded at a safe distance, and when one mile east of the eastern point of the island a course S. 32° E. should be steered for the middle of the channel between Bukas island and Mindanao, leaving Amagadpagat islet one mile to starboard; having passed through the channel the vessel can steer East into the Pacific.

A steamer can pass between Guntuan and Bayatnan islands, taking care to avoid the reef off the north point of the last named island, and leaving to starboard the islet which lies half a mile south of the south-west point of Guntuan. A course S. 47° E. will then lead to the middle of the channel between Bukas and Mindanao.

MINDANAO ISLAND.—This island, next to Luzon is the largest of the Philippines; it contains an area of about 36,240 square miles. The coast line is very uneven, and is much indented with deep bays and inlets, those of Iligan on the north, and Illana on the south, leaving an isthmus between them little more than 30 miles wide, or scarcely 13 miles at the head of port Misamis. The island is drained chiefly by two rivers, the Rio grande de Mindanao, which enters the sea by an extensive delta at Kotabato in the southern part of Illana bay, and which drains an extensive plain with several large lakes; and the river Agusan, the mouth of which is in Butuan bay on the north side of the island, though it rises near to the head of Davao bay far to the southward.

The whole island of Mindanao being less than ten degrees from the equator, its climate is hot and humid, and more equable than that of Luzon. It is under the influence of the monsoons of the northern hemisphere, but beyond the region of typhoons. It has all the products of the other islands of the Archipelago, and in addition cinnamon, nutmegs, pepper, and a great variety of timber. Gold dust is found in the sands of the rivers. In 1899, the population of Mindanao, including the smaller

adjacent islands, was considered by the Philippine Commission to be about 232,000.

Communication.—Mindanao is connected with the general telegraph system by submarine cables to Negros, Sebu, Leite, Panny, and Manila; a cable is also laid between Samboanga and Sulu.

North Coast of Mindanao.—**Butuan bay.**—The southern shore of this bay, between the river Butuan, which enters the eastern angle, and the town of Nasipit 13 miles to the westward, is low, covered by mangroves, and bordered by shoal water for a short distance. From Nasipit to Diuata point, 8 miles to the N.N.W. the shore is fringed by a reef which extends out half a mile.

The commander of the Spanish gunboat *Lezo* reported in 1891, that where 3 to 4 fathoms is shown on the plan of Butuan bay, no soundings were obtained at 60 fathoms; also that in the middle of the bay there is a shoal about a mile in extent, with 6 to 8 fathoms over it, and depths of 27 to 41 fathoms at the edge.

Agusan river, one of the most important in Mindanao, is supposed to take its rise not far north of Davao bay on the southern coast. The two points that form the entrance to the river may be recognised by the forts constructed on them. From the north point a bank of sand extends more than $1\frac{1}{2}$ miles to the westward, and dries at low water.

An island with trees upon it about 40 feet high divides the mouth of the river into two channels; the present channel (1902) lies westward of the island and is marked by three stakes. To enter, a vessel should steer in East between the two outer stakes (inclining towards the northern one) for the monument in the village, and pass northward of the inner stake. There is a depth of 11 feet on the bar at high water, ordinary springs. The current is very strong, and during the rainy season frequently brings down trunks of trees.

Tides.—Only one high-water generally occurs during the 24 hours, and this by day or night according to the season.

Butuan town is situated on the left bank of the river Agusan, about 4 miles from the mouth, and contains about 2,000 inhabitants, chiefly engaged in working a gold mine in the vicinity. The anchorage is frequented by traders from port Misamis, and from Sebu, and there is said to be a depth of 3 to 5 fathoms between the bar of the river and the town; vessels should keep in midstream.

Supplies of cattle, pigs, poultry, rice and sago are obtainable.

Nasipit is an excellent typhoon anchorage, where complete protection is afforded in the inner harbour, in a depth of 5 to 6 fathoms, mud. When entering from the outer harbour, vessels should keep close to the low point on the starboard hand, where the bank is steep-to.

Diuata point is low, sandy, and surrounded by a reef which commences about Nasipit, extends out half a mile from the point, and continues round it to the westward.

Sipaka point can easily be recognised by a conical hill of good height, thinly wooded, with a watch tower on it; the shore is clean and steep-to, with a depth of 55 fathoms very near it. In the bay on the east side of the point there is anchorage in $2\frac{3}{4}$ and $3\frac{3}{4}$ fathoms, sand and mud, before the mouths of two rivers; the shores of the bay are low and covered by mangroves. Anchorage may also be had on the west side of the point in a depth of $2\frac{3}{4}$ fathoms, under the shelter of Kanauayor islet.

Bagakay point is not very high, and is fringed by a reef about half a mile wide, with a depth of 5 fathoms near it. The coast between Sipaka and Bagakay points is formed by sandy beaches alternately with rocky bluffs and mangrove shores.

Kamiguin island, lying $5\frac{1}{2}$ miles to the north of Bagakay point in Mindanao, is about 12 miles long north-west and south-east, and 8 miles wide east and west; it is extremely mountainous and steep, rising to a central peak elevated 5,338 feet above the sea. On the north-west part, $2\frac{1}{2}$ miles east of the town and anchorage of Katarman rises a double peak 4,797 feet high. The island produces rice, good tobacco, wax, and cacao in abundance. The population amounts to 20,610 inhabitants.

There are some anchorages off it, only sheltered in certain winds, and not very safe. The *Challenger* anchored north-west of the town of Agajo in a depth of 6 fathoms, with the north point of Kamiguin bearing N. 78° E., the north-west point S. 50° W., and the sandy cay north-west of the island N. 40° W.

Both Agajo and Manbajao points have reefs off them. The sand cay above mentioned lies three-quarters of a mile N.W. of the town of Agajo; it is about 3 cables in extent and 6 feet above the sea at high water, springs, and has bushes on it. A rocky shoal three-quarters of a mile long lies east $2\frac{1}{2}$ miles from Manbajao point.

From Manbajao point the coast is rocky as far as Maginok, a town of about 4,000 inhabitants, off which there is anchorage in a depth of 9 fathoms, sand. The south-eastern point of the island has some sand patches off it. The town of Sagay, of 5,200 inhabitants, off which there is anchorage in $5\frac{1}{2}$ fathoms, lies 2 miles north-west from the south point.

On the west side of the island there is anchorage off Katarman, a town of 4,300 inhabitants, between two low points; and also in a nook southward of the point which forms the limit of Katarman bay. The mount Two Peaks, east of Katarman, serves as a guide to it.

The town of Katarman was destroyed in 1871: the following is a description taken from the report of the *Challenger*, which visited the

island in January 1875. "The volcano at Kamiguin island burst forth in July 1871 from some low land on the west side of the island, and in two months had thrown up a hill two-thirds of a mile long, one-third of a mile wide, and about 450 feet high, destroying the whole vegetation for miles round, as also the flourishing village of Katarman on the western shore. The volcano had at the time of the visit attained a height of 1,950 feet, and was still in vigour as denoted by the column of smoke seen by day, and the series of small fires visible at its summit by night. Nearly all the inhabitants of Kamiguin, the population of which formerly amounted to 11,000, had left the island in consequence of the outburst."

Bantiki islet, which lies nearly 4 miles off the east coast of Kamiguin, is surrounded by rocks extending to the distance of half a mile, except on the southern side where anchorage may be had in a depth of 3 fathoms, sand.

Tidal stream.—The flood stream entering through Surigao strait, passes to the S.W. on both sides of Kamiguin island with great force, but loses its strength as it enters Makajalar bay on the coast of Mindanao.

Gorda point.—From Bagakay point the coast trends to the southward, forming a slight indentation with four towns on it; at a distance of 16 miles lies Gorda point, which is bold with a flat crown, wooded and steep-to. Balingasag bay, between Gorda point to the south, and Banbayan point to the north, is $2\frac{1}{2}$ miles wide, and falls back one mile to the south-east; there is anchorage in front of the town of Baliugasag at the distance of 2 cables from the shore, in a depth of 9 fathoms, sand and rock.

Dangers.—Constancia rock, about a mile westward of Banbayan point, has not been examined, and its position is not well known. The channel between it and the point is clear.

Alutaya shoal lying S.W. by W. $\frac{1}{2}$ W. $2\frac{1}{2}$ miles from Gorda point, is of oval form with a greater diameter of one mile; at low water the centre uncovers, leaving dry a bank of sand and rocks. In the channel between it and the coast the depth exceeds 40 fathoms.

MAKAJALAR BAY is an extensive bay, open to the north-west situated between Gorda and Sulauang points. The eastern coast of the bay is steeper and higher than the western, and is formed of sandy beaches separated by a low, level, headland. The western shore is clear and steep, but from Malugan point a reef extends north-eastward to the distance of 7 cables. The centre of the bay is deep, but has not been sounded out.

Jasaan, south of Gorda, is a town of 5,000 inhabitants; in the elbow north of the town, called Kabulig bay, there is anchorage well sheltered in both monsoons, but close to the shore, in a depth of 13 fathoms, muddy sand.

Kagayan river, which enters at the head of the bay, has only one fathom on the bar at low-water; but the depth and direction are constantly changing with the freshets of the rainy season. The river pours out a considerable quantity of water at the rate of 2 knots an hour at ordinary times. The town of Kagayan, with a population of 8,900, lies 6 miles up the river, and small vessels ascend to it. A fair amount of trade is carried on, and gold is found by washing, in the mountains.

Anchorage.—At half a mile north-east of the mouth of the river, there is a small bank of sand covered by a depth of from 3 to 11 fathoms, where anchorage may be had sheltered from all winds except those from north to west. Vessels can also anchor near Vantay point in 22 fathoms.

Telegraph cable.—From near the mouth of the Kagayan river a submarine cable is laid to Iligan, whence connection is made with the general telegraphic system. *See* p. 30.

Opol bay is 5 miles westward of the mouth of Kagayan river; there is anchorage in front of the town in a depth of 12 fathoms, near a sand bank. A steep reef fringes the coast for one cable near Opal, and extends 7 cables north-eastward from Malugan point.

Alubijit anchorage is 7 miles north-west of Opol, and south of Sulauang point, where the coast forms an elbow fringed by a reef to the distance of $2\frac{1}{2}$ cables. The anchorage is north-east of the town, in a depth of 17 fathoms, and to the north of some houses on the beach.

Sulauang point is of uniform height, covered by mangroves; rocky ledges stretch out to nearly one mile from it, surrounded by deep water.

ILIGAN BAY.—Between Initao point to the east, and Polo point to the west, is a great arm of the sea, about 37 miles across, and 24 miles deep, open to the north; its shores are in general safe and steep-to.

Maputi point.—The coast from Sulauang point curves round to the south-west for 16 miles to Maputi point which is of moderate elevation, precipitous, and rugged. On the north side of the point there is a little bay, Initao, and a creek, in which small craft can find anchorage in $2\frac{1}{2}$ fathoms, in front of the town.

Kinalang road offers good anchorage in a depth of 11 fathoms sheltered from the eastward, about half a mile from the shore. Good water can be obtained here. Iligan river, situated in the south-east angle of Iligan bay, is of some importance, and communicates with a lake distant 23 miles from the mouth; the bar is deep but there are reefs at the entrance. The town of Iligan, of 5,500 inhabitants, is near the mouth of the river in a fertile plain; the anchorage is bad, as very deep water is found close to the mole.

Telegraph.—A land wire runs from Iligan to Lintogo, whence a submarine cable is laid to the south point of Negros. Lintogo is also connected, *via* Illana bay and Samboanga, with Sulu.

Binuni point is low, clean and steep-to. The bight of the coast between it and Iligan river is bordered by sand beaches with some rocks, and receives the waters of several rivers. Anchorage may be had in a depth of 7 fathoms close to the shore, which is steep.

Panguil bay.—This is the name given in the Derrotero to the inlet in the south-west angle of Iligan bay included between Binuni and Tabú points, which form the entrance to port Misamis. The western shore of the inlet is formed by the slopes of mount Malindang and the lesser hills S.S.E. of it. On the south side of port Misamis are three hills, the highest of which attains an elevation of 2,348 feet.

PORT MISAMIS is formed by a channel 10 miles long, and one to 2 miles wide, ending in a shallow circular basin 5 miles in diameter. The sides of the port are low and covered by mangroves; but to the northward of the town of Misamis there is an extended sandy shore, and to the southward there is a line of higher coast.

Eastern shore.—Biaui point is round, covered by mangroves, and has some rocks off it; from this point the shore trends W.S.W. for 4 miles, low and covered by mangroves to Lianga point, near which there are patches of sand covered by depths of $3\frac{1}{2}$ and $5\frac{1}{2}$ fathoms, affording anchorage sheltered from the south-west. Narvaez bank is a small patch of coral, covered by $1\frac{3}{4}$ fathoms, lying W. $\frac{3}{4}$ N. $1\frac{1}{2}$ miles from a little house on Lianga point. A reef with $2\frac{3}{4}$ to 6 fathoms on its western edge lies in mid-channel at $7\frac{1}{2}$ cables from the shore between Misamis fort and Labó point; the rest of this reef has not been sounded. This reef is reported not to extend so far westward as charted.

Western shore.—Tabú point is low and sandy, with shoal water off it. From this point a reef of coral, 8 cables wide, fringes the shore to the southward nearly as far as Lokulan, where two little rivers discharge. Anchorage may be had east of the fort of Lokulan in a depth of $6\frac{1}{2}$ fathoms; and south of this bearing the bottom is strewn with large rocks. From Lokulan to Misamis the shore is low and sandy, with mangroves in places; it is fringed with shoal water to the distance of one cable, which is reported to extend out to 3 cables between Labó point and Misamis fort.

Lokulan shoals are two banks of sand and rock on which large trunks of trees may often be seen stranded by the currents. The westernmost and longer of the two, is oval in form, 9 cables in diameter, and is separated from the coast by a channel about 4 cables wide with a depth of $3\frac{1}{2}$ to 9 fathoms. The eastern edge of the banks near which there is a

depth of 18 fathoms, lies N. 48° E. from Misamis point. South of Misamis the channel is clear with a depth of $4\frac{1}{2}$ to 7 fathoms, sand, throughout its length to the entrance of the inner basin, where the depth increases to 9 fathoms, and then falls again to half a fathom at the bottom of the bay; several small rivers enter the bay here between the mangroves.

Anchorage.—The anchorage of Misamis is on the western shore, between the fort point and Pulut point, a mile to the S.W., in a depth of 5 to 7 fathoms. It is completely sheltered from the sea and all winds; and the shore is so steep that vessels can lie along the beach and put a plank from the ship to the shore in front of the town, when afloat in a depth of $4\frac{1}{2}$ fathoms, sand.

The town of Misamis, of 5,800 inhabitants is divided into the old and new towns; they lie 220 yards apart, and are joined by a bridge.

Directions.—To enter the port of Misamis from a position 2 miles eastward of Tabú point, a vessel should steer S. $\frac{1}{4}$ E. until the fort of Misamis bear S.W. by W. $\frac{1}{4}$ W. when a course S.W. $\frac{3}{4}$ W. will lead in mid-channel between Lokulan and Narvaz shoals, and midway between the shore near Labó point and the reef south-eastward of it, in a depth of $5\frac{1}{2}$ and $6\frac{1}{2}$ fathoms, and past the fort, to the anchorage south-west of it.

Telegraph cable.—A submarine telegraph cable is laid between Lintogo, port Misamis, and Negros, which connects Mindanao with the general telegraphic system. See page 30.

COAST.—Along the western shore of Iligan bay the points and shore generally, is foul to the distance of about half a mile, with reefs covered by less than 3 fathoms; between Tabú and Dinalan points, the fringe of sand and rocks extends to one mile, and dries in places at low water.

Dinalan point is low, covered by mangroves, very clean, and bordered by a sand beach. Layaban point is low and sandy, with a depth of 7 or 8 fathoms off it at a short distance.

Jimenez.—The town of Jimenez, immediately northward of Tabú point, is easily recognised by a prominent stone church with spire situated well back among the trees.

There is good anchorage behind the reefs, but the harbour is difficult to enter and should be approached only in bright weather in the early morning; it is surrounded by reefs with two very narrow but clear channels in which the depth is 7 to 9 fathoms. A blockhouse and warehouse mark the landing place and end of a good road to the town of Jimenez, about a mile distant. The channel runs in about W. by S. $\frac{1}{4}$ S., and in taking it a vessel should keep close to the main shoal. The anchorage is with the blockhouse bearing S.W. by W. $\frac{3}{4}$ W., in depths of from 12 to 4 fathoms, shoaling gradually to about $1\frac{1}{2}$ cables from the shore, when it decreases rapidly from $3\frac{1}{2}$ fathoms to the beach.

A river, with from 3 to 5 feet on the bar, lies northward of the anchorage and leads to the town.

Aloran, a town of considerable size situated 4 miles northward of Dualan point, which may be known by a large white hip-roofed building well back among the trees, has good anchorage off it in a depth of 19 fathoms shoaling gradually to the shore. The anchorage, which is sheltered from southerly and westerly winds and has good holding ground, lies in a break of the coast reef extending out half a mile on each side of the town; to enter, steer in on a S.S.W. $\frac{1}{2}$ W. course heading for two square warehouses.

Orequita, a village lying about a mile northward of Layaban point, is readily distinguished by a large white warehouse, visible at a considerable distance; there is good anchorage off it during southerly and westerly winds close to the shore, with the Municipal building bearing S.W. $\frac{1}{2}$ S., in a depth of 12 fathoms, shoaling quickly to 4 $\frac{1}{2}$ fathoms.

Light.—In front of the Municipal building at Orequita, a *fixed red* light of small power is exhibited.

Polo point, 7 miles N.N.W. of Layabau point, is of dark rock, clean and steep-to with trees on it reaching to the water's edge. The coast between the two points is bordered by mangroves, and, south of Polo point near the shore, there are two islets surrounded by a reef which extends seawards one mile from the main shore.

Langaran bay, westward of Polo point, affords good anchorage in south-west winds in a depth of 5 to 6 fathoms, mud. Reefs project from the entrance points, and the chart shows a shoal covered by 3 $\frac{3}{4}$ fathoms at the distance of 2 miles from the village of Langaran at the head of the bay.

Bombon point, 6 miles from Polo point, is low, clean, and steep-to.

Rocky bank.—About 13 miles eastward of Bombon point, in lat. 8° 40' N. long. 123° 51' E. approximately, there is a shoal of coral and white sand, with a least depth of 16 feet on it; the bank is about 3 cables in extent within the 5-fathoms line, and is surrounded at the distance of a mile with depths exceeding 50 fathoms.

Murciélagos bay between Bombon point, and Silla point is fringed by a reef which extends a mile from the sandy shore; on the west side, south of Silla point there are three islets within the reef, named Murciélagos. Bombon point also has three rocky islets joined to its north-west side, and the reef projects at this part 1 $\frac{1}{4}$ miles towards the middle of the bay. There is anchorage in a depth of 5 $\frac{1}{2}$ fathoms, mud, near the river which enters the south-eastern angle of the bay; elsewhere there is no bottom at a depth of 45 fathoms.

Silla point is of considerable height, and remarkable, as it takes the shape of a saddle; rocks surround it at not more than a cable's distance.

Tagolo point is not very high, and is surrounded by a narrow reef, but at the distance of one cable from it no bottom was found at a depth of 36 fathoms; a patch of *cogonal* on the point is visible at the distance of 20 miles. Between Silla and Tagolo points there is an intermediate point, Baloy, which is high, rocky, and rugged, its peaks showing most fantastic outlines. The shore from Silla to this point is low, and covered with mangroves, with rocks off it; but from the point to Tagolo it is high and steep.

Tidal streams.—The tidal streams are very strong off this part of the coast. The flood makes to the east, and the ebb to the west.

Silino island which lies N. by E. $\frac{1}{2}$ E. $7\frac{1}{2}$ miles from Tagolo point is about $1\frac{1}{2}$ miles in extent; it is low, flat, and wooded, with sandy shores bordered by reef that projects in a south-westerly direction from its west end to the distance of a mile.

Aligbay island, lying W. $\frac{1}{2}$ N. 8 miles from Tagolo point, is about one mile in extent, and is low, flat, and wooded, with sandy shores; it has a fringing reef of no great extent.

Banks.—Coral patches of $3\frac{1}{2}$ fathoms and 6 fathoms lie S.S.E. of the centre of Aligbay island, distant respectively $2\frac{1}{2}$ and 5 miles; it is probable that there are other patches in the vicinity.

DAPITAN BAY, contained between Tagolo point to the north and Sikayak point to the south, is sheltered from all winds but those from the westward. The depth at the entrance of the bay is 17 fathoms, and at the anchorage before the town $4\frac{1}{2}$ fathoms. The little port of Talaguilong is in the northern part of the bay.

The northern coast of the bay is high; Tubud point, $1\frac{1}{2}$ miles south of Tagolo point, is remarkable by having over it an isolated, conical hill covered by *cogon*; a reef which uncovers at low-water lies west 3 cables from the point, and the shore between it and Tagolo point is foul to the distance of nearly half a mile.

LIGHT.—On Tubud point a *fixed red* light is exhibited, elevated 43 feet above high water, and visible in clear weather at a distance of 11 miles, from the bearing South, through east and north, to N. 33° W. The lighthouse, 19 feet high, is of iron, painted grey.

Port Talaguilong is nearly circular in form, 7 cables in diameter, almost completely shut in, and very convenient for vessels of all sizes; a

See chart, No. 2,578 [2,648], and plan of Dapitan bay, No. 957 [2,646].

narrow steep reef lines the shores. The entrance passage is $1\frac{1}{2}$ cables wide between the reefs, and the depth of water inside from 5 to 8 fathoms mud.

Tides.—From a few observations made in 1836 by Captain Halcon, of the Spanish Navy, the time of high water in port Talaguilong, at full and change, is at 3h. 40m.; springs rise 5 feet.

Dapitan river and town.—The bar of the river has very little water on it at low water, *lanchas* can enter at high water. The town, of 5,700 inhabitants, is on the left bank of the river near the shore; it exports good cacao, wax, and maize; cattle are to be had in abundance.

NORTH-WEST COAST.—**Sikayak point** is surrounded by a reef which extends 3 cables from the point and fringes the shore to the north-eastward as far as Botogan point.

A great bay, clear and with good anchorage stretches between Sikayak point and Blanca point. Three rivers, their mouths defended by forts, enter the bay. The land behind is mountainous.

Blanca point, one of the most remarkable features of the coast, is a perpendicular cliff of white stone 26 feet high; it forms a horizontal table covered by grass with no trees upon it. During the rainy seasons, a rivulet of good water falls from this table-land. The vicinity of the point is shoal; at the distance of 2 cables from it there is a depth of $1\frac{1}{2}$ fathoms only. Anchorage may be had eastward of the point in $4\frac{1}{2}$ fathoms, and also in the bay between Blanca and Daut points.

Daut point is clear and steep-to, and can be recognised by a little hill that takes the form of an obelisk.

Tabonan point is high, rocky, and very steep, with a flat summit; there is anchorage in the bay which this point forms with Daut point.

Dauigan point is also high and steep with a flat top; on its south-west side there is a narrow reef with 9 fathoms near it. Anchorage may be had in the southern angle of the bay between Dauigan and Tabonan points in a depth of 11 fathoms; the other parts of the bay are foul.

Sindangan bay.—The shores of this bay are exceedingly steep; anchorage may be had south of Dauigan point in 3 fathoms, and also east of Sindangan point in a depth of 11 fathoms, very close to the shore; everywhere else the bay is too deep, even near the shore, for anchorage. Sindangan point is a steep rocky bluff, bordered by a narrow shoal of rocks and sand, with breakers at the distance of one cable.

GALERA or KIPIT POINT is low, flat, and sandy with shoal water off it; the bay to the eastward, into which the river Kipit flows, is shoal with the depth of 6 fathoms at the distance of two miles from the coast; the surrounding land is low.

See chart, No. 2,578 [2,648].

The **Murcielagos islands** which lie north $2\frac{1}{2}$ miles from Galera point, are situated on an oval reef about a mile long east and west, with depths of $4\frac{1}{2}$ to 7 fathoms around its edge. The islands are low, and the largest (the easternmost) is 3 cables in length. Anchorage may be had south-east of the island in a depth of 7 fathoms, sand. The channel between the islands and Galera point is clear and safe, with a depth of 18 fathoms in the middle of it.

Coast.—To the westward of Galera point the coast is low, and bordered by sand beaches separated by rocky headlands, and cut into by several little streams. Anchorage may be had at one mile from the shore in a depth of 7 fathoms, fine sand. The wood on the coast is that named *Agojos*, a tree similar to the pine of Europe. High mountains can be seen inland, and also hills covered with *cogonal*.

Gorda head and Coronada point, are both high and steep, but Gorda head which lies 4 miles N.E. by E. of Coronada point is much the higher, and is liable, by vessels coming from the southward, to be mistaken for the western extremity of the land.

Winds on the north coast of Mindanao.—Both monsoons blow with strength on this part of the coast, and together with the tides from the strait of Surigao raise a chopping sea. During the S.W. monsoon the land breezes are regular; they blow from sunset to morning, and shift sometimes to S.E. and E.S.E., but during the *collas* remain at S.W. *Collas* is the name given in the Philippines to the S.W. gales that blow occasionally from July to October, with violent squalls and heavy rain.

During the N.E. monsoon the land breezes are not regular, but still they are experienced when the monsoon is established, and the winds vary from North to N.E. and E.N.E. The coast is very exposed at that season.

In navigating this coast under sail, in either monsoon the coast of Mindanao should be approached in order to profit by the land breezes; but care must be taken to guard against the violent squalls that come off the mountains.

Currents.—Between the islands Pannon and Kamiguin there is a constant current to the west in both monsoons, varying in strength according to wind and tide. South of Bohol the currents follow the direction of the prevailing monsoon. Near the coasts, and within the great bays the current is influenced by the discharge from the rivers.

WEST COAST OF MINDANAO.—From Coronada point the coast is clean and steep-to as far as Bulangolan point, which lies $14\frac{1}{2}$ miles S.S.W. $\frac{3}{4}$ W. Coronada bay, south of the point of the same name, is sheltered from all winds but those from the westward, and offers anchorage

in a depth of 9 to 13 fathoms, sandy bottom. In the angle to the northward, where a little stream enters, the depth is $2\frac{1}{2}$ to 4 fathoms.

Bulangolan point, composed of dark ferruginous rock, is low and very steep-to. The little bay to the north-east of it is more sheltered than that of Coronada, but its shores are very steep, so that to get into a depth of 10 fathoms it is necessary to go very close in shore. At a mile to the northward of the north point of this bay there is a small islet clean-to and steep.

Port Santa Maria.—This well-sheltered little port is situated immediately to the southward of Bulangolan point. It is about a mile deep to the south-east and contains two little basins of 13 fathoms depth, very convenient for vessels of good size. The entrance is 2 cables wide and 36 fathoms deep. In the middle of the port the depth is 15 fathoms and a little less near the shore. A narrow reef lines the coast and extends to the distance of one cable from the entrance points of the western basin; the salient points of the reefs at the entrance to the south-western bight are marked by beacons. The shores are low and covered by forests of good trees; amongst them teak is to be found. Water can be obtained from a little stream in the eastern end of the port.

Balanguin (Dulanguin) point to the south-west of port Santa Maria is rocky, of no great height, and steep-to; it resembles Bulangolan point, and, coming from the southward, may be taken for it. At 3 cables from the coast between this point and port Santa Maria, there are four detached rocks, clean-to.

Sikogon bay, between Balanguin and Sikogon points, is clean, deep, and bordered by a beach of white sand, where two small rivers discharge; some rocks lie near the shore in the middle of the bay. The depth at the distance of 2 cables from the shore is $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms, sand.

Sikogon point is rocky, clean and steep-to. In the north-east angle of Panabutan bay, to the south of the point, there is anchorage in a depth of 7 to 22 fathoms, sand, between two rocky points. The rivers Sikogon and Siraguay are shallow. The natives are numerous in this place; they grow maize and tobacco, and carry on trade with the Sulu islands. Wood and water can be obtained.

Kauit bay is semi-circular, and 9 cables in diameter, with sandy shores and small steep reefs on both sides of the entrance. Near the south shore there is an islet of one cable extent, clean and steep on the eastern side, with a narrow reef on the western side. In the bay there is good anchorage in depths of $4\frac{1}{2}$ to 9 fathoms, sand, under shelter of the islet.

Kauit point is high and steep; the sea face is composed of red earth; the summit is rounded and covered with trees.

See chart, No. 2,578 [2,648], and plan of port Santa Maria, 957 [2,646].

Coast.—From Kanit point to Batotindok point, which lies 9 miles S. by W. $\frac{1}{2}$ W. the coast is clear and steep, and forms little bays between the intermediate points Piakan and Nangan, which are high, rugged, and steep. This part of the coast, like all the west coast of Mindanao, presents an agreeable aspect of hills covered with verdure, and cultivated land, with a great number of houses.

Batotindok point is high, clean, and steep, with a flat summit; at 130 yards from it is a small pointed rock from which the point appears to take its name—Horn rock; between this point and Nangan point there is anchorage near the shore in a depth of 3 to 8 fathoms.

Sibuko bay, which lies between a point 2 miles south of Batotindok point and Buril point, is $2\frac{3}{4}$ miles wide at the entrance, and penetrates 2 miles to the eastward with steep shores bordered by a long beach of sand; there is a little river at each end of it where boats can enter and obtain water, even at low tide. The depth in the bay is not less than 27 fathoms except when very close to the beach, where 11 fathoms can be obtained. The anchorage is good, but a sea sets in with westerly winds. The town of Sibuko, containing 5,000 inhabitants, is 2 miles inland. The people are peaceful, and the land cultivated. Provisions are procurable.

Coast.—Southward of Sibuko bay the coast is high, clean, and steep, and bordered by sand beaches interrupted by rocky cliffs as far as Batalampon point, the western extreme of Mindanao. From Batalampon point to Samboanga it is low, covered with trees, and bordered by steep sand beaches with a depth of 14 fathoms at a cable's distance. Coasters going from Samboanga, when the wind and tide are against them, land their crews and track their vessels to Caldera point.

Batalampon point is of even height, and steep with a flat crown; Alimpaya point, about a mile to the northward of it, is flat and sandy; Dumalin and Caldera points are sand-beaches; all these points, as also the rounded coast they define, are clean and steep-to.

The **tidal streams**, which at springs reach a velocity of 5 knots an hour, set towards Caldera point with great force.

The coast from Caldera to Samboanga and the anchorage off Samboanga has been described with Basilan strait in Chapter II.

See plan of Sibuko bay, 957 [2,646], and chart, No. 2,576 [2,605].

CHAPTER VIII.

VERDE ISLAND PASSAGE TO SAN BERNARDINO STRAIT;
MARINDUQUE, BURIAS, TIKAO AND MASBATE ISLANDS;
NORTH AND WEST COASTS OF SAMAR.

Variation $0^{\circ} 40'$ East in 1902.

SOUTH COAST OF LUZON.—**Tayabas bay.**— From point Sigayan or Lokoloko the shore trends 4 miles N.E. by E. to Bantiki point, which is surrounded by rocks to the distance of 3 cables. The land behind these headlands is low and thickly wooded.

Kolokonto bay.—At $1\frac{1}{2}$ miles north-west of Bantiki point is the southern point of an inlet running one mile inland, named Kolokonto bay, the entrance of which is two-thirds of a mile wide; there is a small islet within it covered with trees, and in front of the entrance several rocks which mostly dry at low water. This inlet serves as shelter to small craft in S.W. gales.

Coast.—From the northern point of Kolokonto bay the coast trends N.N.W. and then curves round north-eastward; it is of regular height, wooded, and bordered by a sand beach. The river Nayun enters the sea at 6 miles from the above point. Its mouth is only half a cable wide, and the depth $1\frac{1}{2}$ fathoms at low water inside the bar; the latter is two cables broad with 3 feet least depth. At half a mile up the stream from the entrance are several wooded islets, and here the river divides into two arms, both of salt water. The river Nayun offers shelter to small coasters, for at its mouth the depth is from 2 to 4 fathoms, lessening towards the islets.

Anchorage.—Vessels of all sizes can anchor off the coast between the mouth of Nayun river and Kolokonto bay, at about a quarter of a mile from the shore in a depth of 12 fathoms, mud.

Tayabas river.—The coast from the river Nayun is low, and bordered with sand beach as far as the river Tayabas, which is three-quarters of a cable wide at the entrance; its bar is 2 cables wide, and in the entrance channel the depth is one fathom at high water, increasing within to 2 fathoms. Native craft, called *parados* and *harakoas*, frequent this river, and armed launches sometimes go up as far as a place named Kota, at one mile from the mouth. The channel is easy to recognise

See chart, No. 2,577 [2,656].

through the stakes placed to mark it by the natives. Fresh water can be obtained at some distance from the mouth. The telegraph station, Lucena, is situated near the mouth of the river.

Reef.—A small shoal which uncovers at spring tides lies half a mile S.W. by S. of the mouth of the river; from this shoal a reef extends $6\frac{1}{2}$ miles in an E. by S. direction, fronting the coast and projecting to a distance of $6\frac{1}{2}$ miles from Bantiki point, the south-western point of Pagbilao bay, and nearly closing up the mouth of that bay. The soundings off the edge of this reef are irregular, from 3 to 11 fathoms.

Pagbilao bay, which lies between Bantiki point and Pagbilao island, is of wide extent, but the available part of it is reduced by reefs to a circular space about $1\frac{1}{2}$ miles in diameter. A pilot is needed to enter this bay on account of the reefs which border the entrance, near the south-west point of Pagbilao Grande; the depth of the channel is from 8 to 10 fathoms; and of the space within, from $4\frac{1}{2}$ to 5 fathoms, mud.

Pagbilao Grande island is of triangular form, and nearly joined to the main land, forming with it the bays of Pagbilao to the west, and Laguinmanok to the east; mount Mitra on the north-east part is 285 feet high. The southern point is steep-to, having a depth of 13 fathoms, mud, at 2 cables from it; this is the point to make for to enter the bay of Pagbilao. Pagbilao Chica is united to the larger island by a strip of sand; it is crescent-shaped, forming to the westward the little bay of Kapaluan, at the mouth of which there is a depth of 15 fathoms, sand, diminishing to $5\frac{1}{2}$ fathoms, rock, at the edge of the shoal water that fills the upper part of the bay.

Laguinmanok port is reduced by reefs from the coasts on both sides to a channel 7 cables wide and 3 miles long, in which the depths gradually lessen from 11 fathoms to 2 fathoms, sand and mud. Great care must be taken to keep clear of the reefs, which advance from both sides of the entry, narrowing the channel considerably; and also of two shoals which lie in line with Laguinmanok vantay, and Kalaba islet $4\frac{1}{2}$ cables S. $\frac{1}{2}$ W. of it. These shoals are situated respectively S. 50° W. and S. 76° W. of Tubig Mangayao point. S.E. by S., distant 3 cables from Kalaba there is another islet similar in appearance to it, with a small detached rock off the south-east side.

Tides.—It is high water, full and change, at port Laguinmanok at 1h. 30m.; springs rise $5\frac{1}{2}$ feet.

Coast.—The eastern shore of Tayabas bay, from Laguinmanok port to Tuguian point, is of moderate height, and fringed with reefs, which extend 2 miles in some places; on the edge of these reefs the depths are from $3\frac{1}{2}$ to 12 fathoms. There is anchorage in 4 or 5 fathoms, sand and

mud, off the mouth of a little river which enters a bay north of Silankapo point, 11 miles from Laguimanok. The town of Kalailayan is near this river.

Shoal.—There is a rocky shoal $2\frac{1}{2}$ miles N.W. of Silankapo point, one mile in extent with a depth of 10 fathoms, coral, outside it, and 8 fathoms in the narrow passage between it and the shore-reef.

Pitogo.—At 5 miles E.S.E. of Silankapo point is Mabio point; and 2 miles E.N.E. of Mabio is the small town of Pitogo, of 900 inhabitants, with anchorage before it in a depth of 4 fathoms. When making for this anchorage, vessels must keep close to the north shore, as the coast to the east-ward is foul, with rocks at a short distance from it.

Tuguian point.—The coast reef projects only half a mile off this point, and anchorage can be found under the point in a depth of 9 fathoms, mud.

Shoal.—At $3\frac{1}{2}$ miles N.W. $\frac{1}{2}$ N. of Tuguian point there is a rocky shoal of small extent, with a depth of $3\frac{1}{2}$ fathoms off its southern edge, and 10 fathoms in the passage between it and the coast, from which it is separated $1\frac{1}{2}$ miles.

Caution.—In navigating this coast, it should not be approached within a distance of 3 or 4 miles. In the passage between Tuguian point and Mompog island the flood tide sets to the S.E. and the ebb to the N.W.

Katanauan bay, 5 miles E.S.E. of Tuguian point, is clean and offers shelter from northerly and easterly winds in a depth of $3\frac{1}{2}$ to 7 fathoms, sand and mud. A small river flows into it, and on the left bank is the town of Katanauan, of 1,700 inhabitants. The west point of the entrance is of sand, and the other mangroves; both points send out reefs, the western to a distance of one mile, and the eastern to 2 miles.

Between Katanauan and Mulanay, a distance of 6 miles, the depth is 9 fathoms, sand, at one mile from the coast.

Mulanay anchorage is in a bight of the coast south-east of Ajus point. A small river enters the sea at the bottom of the bight, having on its left bank the town of Mulanay, of 1,300 inhabitants, in front of which there is anchorage in a depth of 5 fathoms, mud.

Lipata point is hilly, and covered with mangroves and sand patches; a ridge of rocks extends some distance to the northward of it.

The coast between Mulanay bay and Bondog point is fringed with rocks which extend to half a mile from the shore to the northward of Ayoni bay.

Shoal.—A rocky shoal, one mile in extent, with a depth of 3 fathoms water at the edge and 7 to 13 fathoms around it, lies about 2 miles

N.W. of Subunguin point, and 3 miles from the coast. The channel between this shoal and the coast reef is 2 miles wide, clear of danger, and has a depth of 17 to 24 fathoms.

Pinamuntangan point.—Aguasa bay, to the northward of Pinamuntangan point, has rocks before its entrance. Pinamuntangan bay, between Aguasa bay and Pinamuntangan point, is small and open to the west. It is bordered on its northern and southern sides by a beach of sand and mangroves; to the northward of the point is a depth of 11 fathoms, shoaling gradually to the shore.

The coast from Pinamuntangan point trends a distance of $7\frac{1}{2}$ miles to the south-east to Bondog point, ending in a sandy beach with detached rocks near it.

BOND OG HEAD (Cabezo de Bondog) is a mountain 1,250 feet high, visible in clear weather at a distance of 30 miles; it stands about $1\frac{1}{2}$ miles N.N.W. of Bondog point.

Bondog point is the southern extremity of the peninsula between Tayabas bay and Ragay gulf; the vicinity is rocky, as is also the part of the coast to the north-east; but the low land soon re-appears, and continues as far as Arena point. The face of the coast here presents several open bays with sandy beaches, offering good anchorage on sandy bottom; the depth in the bays decreases gradually to 8 fathoms at a short distance from the shore. The heights are wooded, and the plains afford good pasturage. There are several herds of buffaloes; and antelopes abound, which may be hunted without difficulty.

Shoal.—At the distance of 3 miles E.N.E. of Bondog point, and about half a mile from the shore, there is a rocky shoal; good anchorage is found north-eastward of the shoal.

MARINDUQUE ISLAND, situated before the eastern entrance of Verde island passage, is nearly circular, with its greatest diameter 24 miles; it is mountainous and elevated, having a range of hills on its eastern side running north and south, consisting of the mountains Tapan, San Antonio, and Marlanga; the soil is fertile, but the island affords few resources, the principal production being rice.

There are two ports, that of Banalakan to the north-west, and of Santa Cruz on the north-east side: also several bays which offer shelter according to the season on the east, south, and west sides, but these anchorages are not very good, and the coast towns are poor. The total population amounts to about 21,700.

Port Banalakan, or San Andres, is surrounded by high wooded land, and vessels can lie inside it in security; the port is confined in space but has anchorage in a depth of 10 to 12 fathoms, mud. There is an inner

harbour which can be entered by towing or warping through the narrow passage, hardly a cable wide, and obstructed by an islet in the middle of the channel. This inner basin is three-quarters of a mile in extent, with a depth of $5\frac{1}{2}$ to 8 fathoms, muddy bottom. A large vessel would find herself not only sheltered in it from all winds, but completely hidden even, for it is entirely closed in.

Directions.—On entering or leaving Banalakan port, the southern shore must be kept (at one cable from which the depth is 10 to 18 fathoms) in order to avoid a rocky patch of great extent off the north side of the entrance; this patch has a quarter of a fathom on it, and lies S.E. of two islets surrounded by rocks that are before the entrance; the entire north-west headland of the island is foul.

Water is difficult to procure, as it is necessary to go well up the stream in order to obtain it fresh, and when there it takes a long time to fill the casks.

San Andres islets are two islets which stretch rather more than a mile to the west from the north-west point of Marinduque island; the distance between the islets is one cable, and the same between the nearest of them and the shore; these passages are foul, but the sea fronts are clear.

San Andres point, the northern extremity of the island, is 751 feet in height, and very steep-to.

North coast.—Between San Andres point and Santa Cruz point, $8\frac{1}{2}$ miles to the eastward, the coast is formed into two bays by Trapichihan point; that to the westward, though lined with rocks, is deep, having 22 fathoms in the middle; that to the eastward is closed by a reef which projects between the islets off Trapichihan point, and continues as far as Santa Cruz, with a depth of 10 fathoms at its edge. Santa Cruz point, is low and covered with mangroves. A reef with large rocks awash at low-water advances from this point a mile to the E.S.E., and forms, together with another reef that projects from Santa Cruz island, the northern mouth of port Santa Cruz.

Santa Cruz port is safe and commodious, has excellent holding ground, and is specially important as a harbour of refuge to vessels overtaken by bad weather while making the passage between Manila and San Bernardino strait. The anchorage for large vessels is in the channel formed by Santa Cruz island with the main shore; when proceeding beyond this channel great care is required to avoid the detached rocks. The town affords but few resources.

Directions.—To enter by the North channel, steer in with the north point of Santa Cruz island bearing S.E.; give sufficient berth to the reef that extends from it, and follow the channel to the south until the port is

See chart, No. 2,577 [2,656].

opened; the depths are from 6 to 16 fathoms in the passage, and 5 fathoms towards the port, shoaling to 3 fathoms, mud, off the *baluarte*.

The south-eastern channel is 4 cables wide at the narrowest part, both sides being lined with coral reefs; the reef on the island projects 2 cables S.E. by S. from the south east point, and dries to the distance of $1\frac{1}{2}$ cables at low water. To enter by this channel, open out the southern shore of Santa Cruz island and head for the middle of the passage, borrowing toward the northern side after passing the south-east end of the island.

The town landing place is on the northern side of the creek at the head of the bight making off westward, distant about $2\frac{1}{2}$ miles from the anchorage; at low water there is barely depth enough for ship's boats; the channel is marked by ends of fish weirs.

The tides are weak in the channel, flood setting south, ebb to the north.

Anibayas.—This is the name of the group of three islands before Santa Cruz port, consisting of Santa Cruz, Maniuyan, and Mompog. The two first are low to the westward, of regular height in the middle, and hilly to the eastward. All three are surrounded by reefs which narrow the channels between them; these channels are only used by coasters. A vessel leaving Santa Cruz port by the Northern channel, and intending to proceed to the southward, should keep all these islands on the starboard hand, giving them a berth of a mile to clear their reefs which project thus far, and she should not trust a smooth appearance of the water. If driven to take the passage between Maniuyan and Mompog, a vessel should keep near to the latter island, for the reefs from Maniuyan approach to within half a mile of Mompog.

Salomague point, 8 miles S.S.E. of Santa Cruz island, is the easternmost point of Marinduque; it is low and covered with mangroves. The intervening coast is fringed with rocks to a distance of half a mile; the depth at the edge is 6 to 11 fathoms, rock, increasing to 54 fathoms, mud, at 2 miles from it. Between Salomague and Marlanga points there is a bay, in the southern part of which, between points Kabuyok and Paniki there is good anchorage near the shore in a depth of 12 fathoms, mud.

Marlanga point is dominated by a high mountain, the north-east shoulder of which marks the commencement of the anchorage. The coast is safe from Marlanga point to Saban point, and may be approached to within 2 cables, at which distance the depth is 20 fathoms. These two points are spurs of the above named mountain.

Elephant islet, about half a mile south of Saban point is a steep sugar-loaf rock, with a few trees upon it. On the north-east side there is a little creek with a sand beach and a depth of $4\frac{1}{2}$ fathoms off it. Between the islet and Marinduque there is 12 fathoms, sand. The French chart shows a small reef lying off Saban.

See chart, No. 2,577 [2,656].

Tres Reyes are three islands of moderate height, peaked and clean except the easternmost, Gaspar, which has rocks on its east side. Between these islets and Marinduque there is a safe passage if care be taken to avoid a shoal of $2\frac{1}{2}$ fathoms nearer the coast of Marinduque than the middle of the passage.

Banod point, is fronted by a reef which extends half a mile to the south-east, and joins the shore again off the town of Gazan; the $2\frac{1}{2}$ -fathoms shoal just mentioned seems to be a part of this reef, detached to the south. The town Gazan, of 700 inhabitants, is 2 miles north of the point. The anchorage is on the open coast, at a distance from the beach, and quite exposed.

Kauit point is low and sandy; a reef runs from it to the S.S.E. as far as Gazan reef, but to the northward the coast, which is of sand beach, is clean as far as Datinuanua point, and to 3 miles beyond, and may be approached with safety. From hence a sand bank, with 7 fathoms at its outer edge, stretches along at half a mile from the shore as far as the south-west point of port Banalakan.

About a mile northward of Datinuanua point there is a small detached shoal with a depth upon it of $4\frac{1}{2}$ fathoms.

Buak river and town.—The town is situate on the left bank of the river at $1\frac{1}{2}$ miles from its mouth which enters the sea to the southward of Datinuanua point. It contains 11,000 inhabitants, and carries on a fair trade with Manila. Steamers call here about once in a week or ten days.

Anchorage.—The anchorage and landing place are abreast two large white warehouses at the mouths of the river Laylay, about half a mile southward of the mouth of the river Buak, at 2 cables from the shore, in a depth of 5 to 12 fathoms, coarse sand. At high water boats can beach, or may enter the Laylay and discharge inside. The bottom shelves steeply, ends of fish weirs marking approximately the 4-fathoms line.

TIDAL STREAMS.—In the part of the sea between Masbate island and Mindoro the currents are not strong except off Arena point the south-eastern extreme of Bondog peninsular, where they acquire some force from the quantity of water that enters and leaves the gulf of Ragay; but in Verde island passage the tidal streams reach a velocity of 3 to 4 knots, and the branches which pass on either side of Verde island cause eddies at their place of meeting again, and at Escarceo point even a partial reversal of the direction of the stream.

The flood streams from the China Sea through Verde island passage, and from the Pacific through San Bernardino strait meet and neutralize each other nearly on the meridian of Bondog point, or in the line between Bondog point and Romblon island. The ebb streams set in the reverse

direction, *i.e.*, from Bondog peninsula outwards, and it has been observed that on coming to Bondog point with a fair tide a reverse stream has been experienced on passing its meridian. The tidal hour of this point has not been determined.

WINDS on the SOUTH COAST of LUZON.—In Tayabas bay and the gulf of Ragay the land breeze which sets in during the night in both monsoons is generally feeble, but sometimes squally, thereby compelling a sailing vessel to anchor in order to avoid being driven off the coast.

GULF of RAGAY.—The gulf of Ragay, included between point Bondog to the west, and point Kadburauan (Panganiran) to the east, 43 miles apart, runs 65 miles inland to the north-west, and, along with the river Viñas which enters the gulf at its head, almost severs the island of Luzon in two at this part, separating the provinces of Tayabas and Carmarines Norte. The gulf of Ragay is generally clear and deep. The port of Pusgo on the west coast, and Pasakao bay on the east coast are its most frequented anchorages. The entrance of the gulf is divided into two channels by Burias island with the islands and shoals off its northern end.

WEST COAST of RAGAY GULF.—The coast between Arena point and port Pusgo is moderately high and steep-to, with depths of 7 to 14 fathoms off it, except at the part opposite Alibijaban island where a reef extends along the shore for 3 miles. Anchorage can be had off the coast generally, but not close in as there are rocks near the shore; the anchorage is good between Palad bank and Alibijaban, in a depth of 14 fathoms.

Sombokobon bay, $3\frac{1}{2}$ miles N.N.W. of Arena point is much frequented by native coasters. In the middle of the bay there is a rocky shoal with a narrow channel between it and the shore. The north point of the bay ends in a reef which projects to the south-east and forms a semicircle offering shelter and anchorage in a depth of $3\frac{1}{2}$ fathoms, fine sand. The town of Sombokobon is on the north-west side of the bay.

Alibijaban island, $3\frac{1}{4}$ miles north of Sombokobon bay, is $2\frac{1}{2}$ miles long north and south, and three-quarters of a mile wide; it is low, wooded, and surrounded by reef which extends one mile to the southward and half a mile from the other sides, with irregular soundings near its edges. The channel between the island and the reef on the main coast opposite, is $1\frac{1}{4}$ miles wide, and has a depth of 23 fathoms.

Palad bank, 5 miles north of Alibijaban island, is a bank of sand one mile long, 10 feet above water, and surrounded by rocks. It shows in daylight at a good distance, and can be seen on a clear night. The channel between the bank and the main coast is 2 miles wide, and carries a depth of 12 fathoms.

Port Pusgo is a narrow inlet which penetrates 5 miles to the north-west. The width between the outer entrance points is $1\frac{3}{4}$ miles, but the navigable space is considerably reduced by shoals extending along the main shore on both sides, and half way up the inlet the width is only one cable. The depth in mid-channel is $4\frac{1}{2}$ to 5 fathoms from the entrance to as far as one mile past the narrowest part, but in the inner harbour generally it is less than $1\frac{3}{4}$ fathoms. The town of San Narciso containing about 1,100 inhabitants stands at the extreme head of the inlet.

Shoal.—In the middle of the entrance, at the distance of $1\frac{1}{4}$ miles S. 25° E. of Pusgo point, there is a rocky bank $1\frac{1}{2}$ cables in extent covered by 10 feet water.

Gorda point lies $1\frac{1}{4}$ miles northward of Pusgo point, and is high and steep with a flat crown. The reef, which from the interior of port Pusgo fringes the coast, continues round Gorda point to the north-west, at a distance of 2 to 4 cables from the shore. A shoal, covered by $1\frac{3}{4}$ fathoms water lies 5 miles north-west of Gorda point, and one mile from the shore.

Piris bay, $13\frac{1}{2}$ miles N.W. by N. of Gorda point, is bordered by a broad shoal of mud covered by $1\frac{3}{4}$ fathoms water, which considerably reduces the available space; anchorage can be had in the north-west part of the bay in a depth of $5\frac{1}{2}$ fathoms. Lian point, at the northern end of the bay, is of moderate height and skirted by a reef which projects seaward half a mile.

Kapuluan point, 5 miles north of Lian point, is surrounded by the reef which borders the coast for $2\frac{1}{2}$ miles to the southward. Kapuluan rocks, $2\frac{1}{4}$ miles east of the point of the same name, form a shoal one-third of a mile in extent, on which there are several rocks awash, with depths of $4\frac{1}{2}$ to 14 fathoms near it.

Guinayan.—There is anchorage off the town of Guinayan, situated at the head of Ragay gulf 6 miles N.W. $\frac{1}{2}$ N. from Kapuluan point, in a depth of 4 fathoms, mud, with a white-roofed house bearing W.N.W.

There is a telegraph station at Guinayan.

Acha shoal, 5 miles N. by W. of Kapuluan point, is a rocky shoal 2 cables long north and south, covered by $1\frac{3}{4}$ fathoms water. It lies $2\frac{3}{4}$ miles from the coast, and $1\frac{1}{4}$ miles from Sipalon island, a low peaked island separated from the reef of the north coast.

Viñas river, which enters the gulf at the extreme head of it, is shallow, the depth at the mouth being only $5\frac{1}{2}$ feet.

EAST COAST of RAGAY GULF.—Talkauayan bay is $1\frac{1}{2}$ miles wide and runs for a distance of $2\frac{1}{4}$ miles to the northward; the depth of water in it decreases gradually from 7 fathoms at the mouth to 3 fathoms at the head.

See plan of port Pusgo, No. 2,395 [2,667], and chart, No. 2,577 [2,656].

Katabanga bay, 3 miles south-east of Talkanayan bay is nearly 4 miles wide between points Guilbay and Bagutayok, and is lined with rocks. The depth towards the northern part is 11 fathoms. There is anchorage in the southern part of the bay near the little river Katabanga.

Ragay bay, between Omon point to the north and Oktok point and Sabun island to the south, affords good anchorage sheltered in both monsoons, in depths of 5 to 11 fathoms, mud. Sabun island, one mile long east and west, is almost united to Oktok point at low water; its northern side is steep-to, but a reef projects one mile to seaward from the western point. The southern shore is foul.

There is a telegraph station at the town of Ragay at the head of the bay.

Kaima bay, included between Sabun island and Galvaney point, 8 miles to the south-east is bordered by reef. There is anchorage near this reef off the town of Bangon in a depth of 8 to 12 fathoms, and also in places nearer Galvaney point in 7 fathoms. Galvaney point is high, with a peculiarly shaped sharp peak near its end, steep to seaward; it is connected with the mainland by a narrow neck of low land, and appears as an island at a distance. The two islets Galvaney are respectively half a mile and $1\frac{1}{2}$ miles north-west of the point.

Coast.—From Galvaney point the coast trends south-eastward 13 miles to Tanuan point, and is mountainous and bold. The small river Tinagbud enters about midway between the two points; anchorage may be had off its mouth in 4 fathoms. A sharp peaked rock lies 2 cables from Buri point, south of Tinagbud. Tanuan point is steep with a flat crown, and from this point the coast trends E.S.E. for 4 miles, high, and fronted by sand beaches as far as Pasakao anchorage.

Pasakao anchorage is situated between two flat-topped hills, the westernmost of which terminates in a mangrove covered point and a reef which projects half a mile to the south-east. The best anchorage is in 3 to 4 fathoms, in front of the town, and north of the high flat islet Refugio which lies half a mile from the southern point. This little islet has a sharp peak with yellow top, and is a good mark for making the place; it is surrounded by a reef one cable wide, and steep-to, with deep water close southward. The channel between the islet and the coast has a depth of 11 fathoms; in taking this passage vessels should keep closer to the islet than the main land. Steamers call here fortnightly.

Coast.—From Pasakao anchorage to Makoto point the coast is high, steep-to, and bordered by sand beaches between the intermediate points. Anchorage may be had very close to the shore north of Sibono point, 6 miles south-eastward of Pasakao, in Jamuraon bay, north of the point of the same name, in a depth of 6 fathoms; and vessels can also anchor

in the elbow which the coast makes at the town of Pantao, north of Kauanlahan point. A shoal surrounds this latter point to a distance of one cable, and lines the coast to the bottom of the elbow.

Apud shoal is a rocky shoal which uncovers in parts at low water, and extends one mile west and two miles N.N.W. from Apud point.

Makoto point is of moderate height, steep, with a flat crown, and is surrounded by a reef. A rocky shoal, half a mile in diameter, and covered by $3\frac{1}{2}$ fathoms, lies one mile north-west of the point. This shoal may generally be distinguished by the green and white colour of the water above it. There is an islet south-east of the point united to it by a reef.

The bay to the eastward of Makoto point offers anchorage sheltered from the north and west. Care must be taken in entering it to avoid a reef which projects from Badian point, the south point of the bay.

Point Kadburauan or Panganiran is low, wooded, and surrounded by rocks to a short distance, with a depth of $4\frac{1}{2}$ fathoms near them.

Tides.—In the gulf of Ragay the flood stream sets to the north, and the ebb to the south. The range of tides at springs is $5\frac{1}{2}$ feet.

BURIAS ISLAND, at the entrance of the gulf of Ragay, is 37 miles long, north-west and south-east, and about 7 miles wide at the northern end, tapering to less than 2 miles at its south-eastern part; it is roughly mountainous, and thinly wooded. Burias is commanded by the lofty mountain Engañosa, situated 12 miles from its south point, and showing a cleft that divides the high land of the northern part of the island from the very low land of the southern part, on which, however, 3 miles from the south extreme rises mount Sagurun, 853 feet in height. The coast is in general steep, and bordered in places by sand beaches. The island has two sheltered ports: Busin, at the north-west end, formed by Busin island lying in front of a bay in the mainland, and Busainga on the north-east coast of the island.

Burias island and the islets and reefs in its vicinity have not yet been thoroughly surveyed. The population is sparse, amounting in 1875 to 11,000. The main productions are rice, maize, and *abaca* (Manila hemp).

There are several small islets and reefs off the northern part: Templo, $2\frac{1}{2}$ miles N.W. of Cueva point, the north-west point of Burias, is 3 miles long north-west and south-east, and $1\frac{1}{2}$ miles wide. There are detached rocks on its south side, and its north point is surrounded by a reef half a mile in width. Sombrero, $1\frac{1}{2}$ miles west of Templo, consists of two islets close together on a reef which extends a mile to the north-west and south-east of them. Arena island, 7 miles S.E. $\frac{1}{2}$ E. of Arena point on Bondog peninsula, is surrounded by a reef which grows out three-quarters of a mile to the northward. A shoal, separated from this last-named islet

by a channel three-quarters of a mile wide and 12 fathoms deep lies $1\frac{1}{2}$ miles to the north of it.

Busin island is $2\frac{1}{4}$ miles long and one mile wide. A shoal projects from its north-west end to the Tinalisayan islets, and unites with the reef that surrounds the little island Tanguingui 4 miles north of Cueva point.

Detached shoals.—One mile north of Tanguingui there is a rocky head covered by $3\frac{1}{2}$ fathoms, with a depth of 75 fathoms immediately north of it; and about 2 miles north of the extreme northern point of Burias there is a rocky shoal half a mile in extent, having less than a fathom over it.

Anima Sola is an islet $4\frac{1}{2}$ miles N. 40° E. of the north point of Burias, surrounded by rocks.

Port Busin is formed by the channel $3\frac{1}{2}$ miles long and $1\frac{1}{2}$ cables wide that separates the island Busin from Burias. The western entrance of this channel is narrow and tortuous, and very dangerous for a sailing vessel; the northern entrance is preferable, as, though narrow it is more direct, and its sides are steep-to. In a working breeze a vessel can keep well in mid-channel. The northern entrance may be easily recognised by the north cape of Burias, point Colorada, which is higher than Busin island, and shows yellow patches among the trees that cover it. The part of the coast also near the entrance may be recognised by the massive bluffs about it.

LIGHTS.—A *fixed white* light is exhibited from a square tower near the extreme of Colorada point at the height of 33 feet above high water; another *fixed white* light, elevated 28 feet, is shown from a square tower on Busin islet at the west entrance; and a third *fixed white* light at the mole head. These lights are not to be depended on.

Anchorage.—The best anchorage is west of fort San Paskual, at the entrance of the bay that opens to the south, on the coast of Burias. The depth of the entrance of this bay is 11 fathoms, lessening to $3\frac{1}{2}$ fathoms, at half a mile within the bay.

Fresh water can be obtained here.

Coast.—Between port Busin and port Busainga, distant $3\frac{1}{2}$ miles to the south-east, the coast forms a bay, from the eastern point of which a reef projects to the northward for one mile, with a depth of 9 fathoms near its northern edge; the reef narrows in to the coast again at the northern point of port Busainga.

Port Busainga is an inlet $1\frac{1}{2}$ miles long, and one cable wide in its narrowest part, which, with the bay at its mouth, affords good holding ground in a depth of 8 fathoms, sheltered from wind and sea. The space, one mile wide, at the bottom of the port is mostly shallow.

See plans of ports Busin and Busainga, No. 2,395 [2,667].

LIGHTS.—A *fixed blue* light is shown from a square tower on Piedras point, the north-western entrance of the inlet, at the height of 27 feet above high water, but it is not to be depended on.

Tides.—It is high water, full and change at Busainga, at Oh. 30m.; springs rise 6 feet.

East coast of Burias.—The bay, 2 miles wide, 5 miles S.E. by S. of port Busainga, appears to be filled with shoals; the remainder of the coast to the southward presents beaches off which there is anchorage on the open coast.

LIGHTS.—At Malaguiling, N.N.E. of the entrance, a *fixed blue* light is shown from a square tower; at Engaño mouth, on the point S.S.W. of the channel, a *fixed white* light is exhibited at a height of 27 feet above high water. The position of these lights is uncertain.

West coast of Burias.—Cueva point, the north-west extreme of the island, is surrounded by a shoal 2 cables wide, from which a reef extends to Guinduanan point, 6 miles to the southward, advancing in some places to a mile from the coast. The remainder of the west coast is sandy, with shoals at no great distance from it, especially in the bend of the coast called Boca Engañososa (false entrance) at the foot of the slope of mount Engañososa, which is the highest elevation in the island. The little islet Gorrión is in this bend, about $1\frac{1}{4}$ miles S. by W. $\frac{1}{2}$ W. from mount Engañososa.

Shoal.—A shoal is reported to exist at a distance of $4\frac{1}{2}$ miles W. by N. from Gorrión islet; the depth over it is uncertain, but it is shown on the charts as a rock having less than 6 feet water.

Caution.—When approaching Burias island from the westward in thick weather, such as occurs in the S.W. monsoon, the southern part of the island, which is comparatively low, may be hidden, and the slope of mount Engañososa may be mistaken for it, and Boca Engañososa for the passage between Burias and Masbate, a mistake which has caused the loss of many vessels, and has given rise to the name of 'False.' Mount Sagurun, 853 feet in height, situated 9 miles south-east of mount Engañososa, and 3 miles within the south point of Burias, forms, however, a prominent feature at the south end of this island.

SOUTH COAST of LUZON.—From Kadburauan point the coast trends E.N.E. for 6 miles, and is foul; the islet Lamuyon or Solitario, distant one mile from the coast, is united to it by a reef which dries at low water. The coast then bends round to the south east, and becomes lower towards Marigondon, which is rocky and steep with a flat top. There is anchorage between Marigondon point and the town of the same name to the northward. From this point the coast trends S.E. by E. 8 miles to Katundulan point, and is low with shelving sand beaches affording good anchorage off it.

Donsol river and town.—Donsol river has a depth of $1\frac{3}{4}$ feet on the bar, from which banks extend seaward half a mile with depths of 3 feet. Inside the bar the depths are 3 to 10 feet for 5 miles up the river. The usual anchorage in depths over $5\frac{1}{2}$ fathoms is at three-quarters of a mile southward of the river's mouth. The town of Donsol, on the left bank of the river, near its mouth, consists of about 5,700 inhabitants, and carries on a trade with Manila in abaca. Supplies, such as poultry, eggs, vegetables, and a few cattle may be obtained. Steamers call about fortnightly.

Four miles eastward of Donsol river is Dumaquit point, and a rocky patch of $4\frac{1}{2}$ fathoms lies a long mile S.S.W. of the point; for 2 miles from Donsol, a shoal covered by one fathom extends off the coast to the distance of three-quarters of a mile.

Port Putiao is a large but shallow inlet, which can be entered by coasters only, and at high water; sand banks on both sides reduce the available width to one half, and at 2 miles from the mouth these banks unite, thus leaving only a depth of 3 feet here for communication with the inner port. The entrance points are one mile apart, and are both surrounded by reefs.

Palatuan bay, to the eastward of port Putiao, is shallow, and dries out to a considerable distance on its eastern side. Off Kutkut point, on the west side of entrance, a pinnacle rock awash at low water lies half a mile southward of the point; a narrow channel leads into the bay, with depths of 3 to 29 feet. With the assistance of a pilot, vessels of from 10 to 13 feet draught can enter the port.

Bantiki point, the western point of the large port Sorsogon is rounded, low, rocky, and wooded, with a shore composed of gravel and clayey cliffs. The coast reef that surrounds the point is narrow, except on the side of Palatuan bay, but shoal ground extends southward from it, probably to the distance of 2 miles; vessels should give Bantiki point a wide berth in passing.

PORT SORSOGON is the largest and best harbour in the strait of San Bernardino, and is a good refuge in case of a typhoon or a *colla*, and for effecting repairs. The entrance is divided into three channels by the islands Malumahuan and Bagatao. The channel between these two islands is the only one practicable for vessels; the others between the islands and the coast being narrow and shoal. A narrow shoal stretches from Malumahuan island almost to the north coast of the port.

Bagatao island.—A bank of fine black sand, with a depth over it of 12 to 14 fathoms, stretches 2 miles south-west of Bagatao island, and offers anchorage to vessels caught by bad weather and unable to reach the port.

The Boca Grande, or principal entrance, is $1\frac{1}{2}$ miles wide, and irregular in depth—from 9 to 20 fathoms. The west coast of Bagatao island is clean; the bottom on the Malumahuan side is shelving, with a depth of 4 fathoms at a distance of 2 cables to the east of that island, but shoal water is reported to extend some distance to the southward of the south end of Malumahuan, with irregular depths and boulders close to the edge. The channel is nearly 6 miles long N.E. by E., with irregular depths of 8 to 20 fathoms as far as Makugil point, on the southern shore. Pinnacle rocks, covered by one fathom, lie N. by W. $\frac{1}{2}$ W. $2\frac{1}{2}$ cables, and North $1\frac{1}{2}$ cables from Makugil point. The coasts and islands on both sides of the channel are clean, and the sea faces of the islets on the north side are steep-to, so that a vessel keeping in mid-channel is clear of all danger.

The inner port of Sorsogon is spacious, extending 9 miles E.N.E. towards the town of Sorsogon, of about 10,350 inhabitants, with depths diminishing gradually from 9 to $3\frac{1}{2}$ fathoms.

Anchorage.—When approaching port Sorsogon, keep Katundulan point open westward of Dumaquit point, or better still, mount Kadburauan open of Katundulan point, until the west point of Bagatao island is in line with the east point of Lavampa islet, then steer in for the middle of the entrance.

Once past Bagatao island a vessel can choose the anchorage suitable to her draught, but if she draws much water it is better not to make for the town of Sorsogon, as a depth of $3\frac{1}{2}$ fathoms is reached at 4 miles from it. There is sheltered anchorage anywhere in the port, but a good place appears to be north of Bagatao island abreast a small stretch of sandy shore, and immediately westward of Tinakos islet. Anchorage may also be taken southward of Bagatao in fine weather or with off-shore winds.

Supplies.—There are many towns on the shores of port Sorsogon, and beef, poultry, rice, and vegetables are all procurable. Water is to be had on the eastern side of the harbour, and from the river Geladiok, opposite Tinakos islet. Steamers from Manila visit the port about twice a fortnight.

Coast.—From the southern point of entrance to port Sorsogon the coast trends S. by E. for 13 miles to Bulak point, and shows broken ground in some places, though in general the shore shelves gradually into the sea by sandy beaches, before which vessels can find good anchorage. All this coast shelves out, with depths of 15 fathoms at the distance of $1\frac{1}{2}$ miles, and of 30 fathoms at 3 miles.

Bulan river and town.—The town of Bulan is situated on the right bank of the river Sabang, which debouches south of Bulak point, and

consists of 2,500 inhabitants. A *vantay* is erected on the sandy point of Bulak. The depth on the bar of the river is $4\frac{1}{2}$ feet at low water, and greater up stream. Coasting steamers call here.

Angas point, $3\frac{1}{2}$ miles south-east of Bulak point, is high; Utabe bay, included between the two, shows a sandy beach off which the depths are 3 to 10 fathoms.

Butag bay, east of Angas point, is about a mile wide, and runs one mile in to the north-east; reefs extend from the points on both sides. The depth of water in the bay is 14 fathoms. The shores are wooded and in some places of considerable height.

Marinap bay, the next bay south-eastward of Butag, is capable of containing vessels of good draught. The shores are sandy in some places, and covered with mangroves in others.

Between the southern point of Marinap bay and Tagiran point the coast is slightly indented with little bays clean and deep, but offering little shelter; there is anchorage in a depth of 11 to 16 fathoms, at a distance of 2 cables from the shore.

Tagiran point, $8\frac{1}{2}$ miles from Bulak point, is a remarkable little hill, 49 feet high, apart from a high mountain range behind it, with a flat top on which is a plot of green clearer than the rest of the hill, and which can be seen at some distance. There are three or four detached rocks about 40 yards from the point with a depth of 5 fathoms close to them, and 13 fathoms at a short distance. A rivulet falls into the sandy creek on the east side of the point.

Tides.—In the channel between this coast and Tikao island the tidal streams run with a velocity of not less than 4 knots.

TIKAO ISLAND is 23 miles long N.N.W. $\frac{1}{2}$ W. and S.S.E. $\frac{1}{2}$ E., and 6 miles wide at its northern end, narrowing towards the south point, San Rafael, from which a chain of islets and rocks extends toward Vigia point in Masbate. The island is mountainous, and but thinly populated. It possesses two ports San Miguel and San Jacinto, neither of them very good.

Port San Miguel, at the north end of Tikao island, is one mile wide at the entrance, and open to the north-west; it enters the land for about 2 miles, but the available anchorage space is very limited, as the depth generally is from 20 to 50 fathoms even close up to the steep shores, except at the south-west part of the port which is almost entirely occupied by a large bank. Near the middle of the bank are the three small Puro islets; from the outermost islet the shoal flat extends northward and eastward to the distance of 4 cables, and upon it small craft may find anchorage in a depth of $2\frac{3}{4}$ fathoms. The southern part of the bay is fringed by a reef.

The three islets, San Miguel, Bagababoy, and a small one lying between them, which form a prolongation of the north end of Tikao, are very steep-to, but must be given a good berth as the tides are liable to set vessels upon them.

Taguan bay, 7 miles south-east of the north point of Tikao, is open to the north-east and is skirted by a narrow reef which extends 2 miles to the north-west and fringes the coast to port San Jacinto, 3 miles S.S.E.

Port San Jacinto is small and open to the east, but has good holding ground; the entrance may be recognised by a fort with rounded bastions on the southern point, with some conical hills, about 330 feet high, behind it. The narrow bank that fringes the coast continues round the inside of the port, almost filling up the north-west part of it; and the 5-fathoms contour-line passes within 3 cables of San Antonio, the northern point, and within $1\frac{1}{2}$ cables of San José, the southern point, reducing the actual width of the available harbour to about $2\frac{1}{2}$ cables. The depth of water lessens gradually from 16 fathoms at the entrance, to 3 fathoms, mud, at the edge of the shoal of sand and mud at the bottom of the port. The town is on the point near the fort and contains about 2,500 inhabitants.

Anchorage.—The best anchorage is on the southern side in a depth of 9 fathoms, with Cosme point bearing N.N.E. and the church and fort of San José E.S.E. Vessels arriving off the port at night, and not caring to venture in, may anchor before the port in 10 to 24 fathoms, but the anchor should be let go immediately the depth of 24 fathoms is obtained, as the bank is very steep-to.

Water can be obtained at the wells and also at a river near.

Tides.—It is high water, full and change, at 6h. 30m.; springs rise 6 feet. The tidal stream is very weak.

Coasts.—The east coast of Tikao presents many little bays open to the east, in which anchorage can be had, as well as on the sand bank that borders the coast, and which extends out about a mile from Biton bay to San Rafael point. The west coast is steep and rugged, and has no good anchorage; a depth of $5\frac{1}{2}$ to 7 fathoms is found along the entire coast at a short distance from it.

PASSAGES BETWEEN TIKAO and MASBATE.—

A chain of islets and rocks with channels between them extends from San Rafael, the south point of Tikao to Vigia point in Masbate, $8\frac{1}{2}$ miles S.E. by S. The most practicable of these channels, is one between Matabao islet, and Black rock, and another between Black rock and Magearagui islet; the first of these is one mile wide with a depth of 36 fathoms, the second is wider and is also deep.

Matabao.—From the east side of this island a bank of sand extends $1\frac{1}{2}$ miles to the north-east, with $2\frac{3}{4}$ fathoms over it, and 8 fathoms near the edges. The narrow channel between this islet and Tikao has a depth of 8 fathoms.

Black rock, one of a cluster of rocks which cover at high water, rises from a shoal which lies north-west and south-east, extending nearly half a mile to the northward of Black rock and over one cable southward of it. On the western side of Black rock is another rocky shoal, a quarter of a mile in length and half a cable wide, covered by $5\frac{1}{2}$ fathoms; beyond this there is another shoal about a third of a mile in diameter, covered by $4\frac{3}{4}$ fathoms, from which rocky ledges upon which there is a depth of $5\frac{1}{2}$ to 8 fathoms extend a quarter of a mile northward and half a mile eastward. The passages between these shoals are from one to two cables wide and 8 fathoms deep.

Directions.—Vessels passing between Matabao and Black rock should steer East until Magearagui islet bears South. Vessels passing between Black rock and Magearagui should steer a mid-channel course, heading about N.E. by E. $\frac{1}{4}$ E. for San Andres, until the middle of the cliff of Deagan island bears South.

The channels between Magearagui and Deagan and the intermediate islets are of no importance; the channel between Deagan and Vigia point in Masbate is 4 or 5 cables wide, and carries a depth of $4\frac{1}{2}$ fathoms.

Tides.—Between Tikao and Masbate there is an exceedingly strong race, with whirlpools, which must be passed through at a considerable speed to maintain steerage. The tidal streams run very strong through the Black rock channels, reaching a velocity of 3 to 5 knots at springs, with violent eddies.

NORTH-EAST COAST OF MASBATE.—Bugui point, the northern extremity of Masbate, is very high, rugged, and steep-to, and can be passed close to in a depth of 7 or 8 fathoms; from the point the coast trends E.S.E. for a distance of 9 miles, as far as port Barrera, and is clean and bold.

LIGHT.—Upon Bugui point is exhibited a *group flashing* light, with a period of *thirty seconds*, showing one *red* and one *white flash* in each group; visible from N. 74° W., through south and east, to N. 7° W., at a distance of 22 miles in clear weather. It is situated 200 yards from the extreme point, and is shown from a conical masonry tower elevated 48 feet above the ground, and 219 feet above high water. (*Temporarily discontinued, October 1901.*)

Port Barrera, $1\frac{1}{2}$ miles wide at the entrance between the ledge off the red cliffy point of Colorado on the north side, and the rock off

See chart, No. 2,577 [2,656].

Katbatan point on the southern shore, is capacious, and the holding ground is good; but over the greater part of it the depth, 20 to 34 fathoms, is too great for convenient anchorage. The shore is fringed with reef, which at Matalantalan point on the western side of the port extends out to the distance of 4 cables.

At the south-west part of the port a creek, into which the river Lanaan enters, penetrates 5 miles inland, or to nearly a mile above the town of San Agustin; the entrance is half a mile wide, and $4\frac{1}{2}$ fathoms deep, but within the creek it contracts, and the depth decreases to one fathom above Lungib point. The creek is moreover largely occupied by extensive mud flats.

The village of Aroroy is near the southern entrance point; the town of San Agustin is situated at the head of the creek.

Anchorage.—There is good anchorage in the north-west angle of the port in a depth of 16 to 22 fathoms; and on the south side of it, off the mouth of the creek in 4 to 9 fathoms.

Water.—Good water can be procured from a cascade near the mouth of the river Lunukluk in the north-west bay; the river can be entered at half tide.

Port Magdalena, 9 miles south-east of port Barrera, is very small, and open to the north-west, but is considered an excellent anchorage safe at all seasons; vessels can secure with hawsers to the trees of the inner part of the port, and although they might be blown upon the mud by the few winds to which the port is exposed they would receive no damage. The anchorage is surrounded by high land covered with impenetrable wood. There are reefs around both the exterior points of the port, particularly the one to the northward. The depth of water is 20 fathoms at the entrance, lessening to $3\frac{1}{2}$ fathoms before the village at the bottom of the port, where there are some shoals near the beach.

Supplies.—Vegetables, poultry, and honey are all that can be had here; water can be procured from two rivulets, but it must be taken from a long way up, as it is not fresh near the port. The town of Balino, of 1,700 inhabitants, is $1\frac{1}{2}$ miles west of the port.

PORT PALANOG, 6 miles south-east of Magdalena, is a small harbour with available anchorage space about $1\frac{1}{2}$ miles long and half a mile wide, in a depth of 9 to 20 fathoms, well sheltered from all winds. The channel is only $1\frac{1}{2}$ cables wide between North-west point and the reef extending $3\frac{1}{2}$ cables towards that shore from the south-east entrance point; the depth in the passage is 27 to 32 fathoms. The interior of the port is lined by reefs, that on the northern side projecting out 4 cables from the shore, when it falls abruptly into a depth of 10 fathoms; the south-west part of the harbour is occupied with a mud flat to the distance

of nearly a mile from the head of the bay. Pulumbato point is a well defined rocky point covered with thick bushes, with cocoanut trees on each side. The wreck of the steamer *Bulusan* lies 50 yards from the end of Palanog pier, covered by 9 fathoms water.

Buoys.—Temporary bamboo buoys, showing about 12 feet above water, mark (June 1900) the eastern extreme of the reef extending seaward from North-west point, and also the western edge of the reef projecting from the south-east side of entrance.

In addition, a temporary wooden tripod beacon, with cross-pieces, painted black, was erected on the point of the long reef on the north side of the harbour.

Directions.—To enter Palanog harbour, steer in with the edge of the trees on north-west side of channel, in line with the beacon just described, bearing S.W. $\frac{1}{4}$ W., until the shore north-west of North-west point is about to be shut out, when head for Pulumbato point, keeping it bearing S. by W. $\frac{1}{4}$ W.; anchor off the town of Palanog, distant about 2 cables from the pier, in a depth of 17 fathoms, mud.

Mobo bay, south-east of Palanog, is 2 miles wide, but almost completely closed by the bank Pontud and other shoals, which leave but narrow entrance channels. Taku shoal, $1\frac{1}{2}$ cables north of Sugausuan point, is $2\frac{1}{4}$ cables in extent, and covered by 3 feet water; Mobo shoal, $4\frac{1}{2}$ cables W. by N. of the above point, is $2\frac{1}{2}$ cables in length, with 3 feet water over it. Between these shoals and the coast of Masbate there is a passage $1\frac{1}{4}$ cables wide with a mean depth of 5 fathoms in mid-channel.

Between Taku and Mobo shoals, and Pontud bank, and between Mobo shoal and the coast, there are channels of 13 to 27 fathoms depth; the anchorage of Mobo is within the space encircled by these shoals.

A small river runs into the southern part of the bay, on the bank of which, at less than a mile from the mouth, stands the town of Mobo, of 1,500 inhabitants. The land round about it is hilly and very fertile.

Uson and Naro bays.—Between Paniki point, 8 miles south-east of Mobo bay, and Vigia point, 7 miles to the eastward of Paniki point, the coast forms two bays, Uson and Naro, both open to the north-west, and separated by a broad hilly headland, point Tabnnan, which advances 3 miles in the same direction from the coast. A bank of sand, with 7 fathoms at its edge, extends half a mile out from the northern extremity of this headland, and fringing the coast to the westward, half fills up Uson bay. This bay is one mile wide and two miles long, with a depth of 14 fathoms at the entrance, lessening to $2\frac{1}{2}$ fathoms near the shoal that fills up the southern half of the bay. At a short distance from the bottom of the bay is the town of Uson. The pilots state that there is good anchorage in Uson bay during the typhoon season, in a depth of 4 to 10 fathoms.

Naro bay is clearer and deeper than Uson bay, having a depth of 18 fathoms at the entrance, and 7 fathoms at the mouth of a small stream within the bay, near the mouth of which is the town of Naro.

Vigia point, the eastern point of Naro bay, has on its western side a little islet, clean on the off side, with a depth of 18 fathoms close to it. On the eastern side of the point there is a shoal which extends nearly one mile out, and fringes the coast to the southward for a distance of 2 miles, where it narrows in to the coast. The channel between Vigia point and Deagan island to the northward is 4 cables wide.

The **EAST COAST of MASBATE**, from Vigia point to Kaduruan point, the south-east extremity of the island, is clean with depths of 5 to 8 fathoms at a short distance from it. Shoal ground extends to about one cable from Matayon point.

PORT KATAINGAN, 19 miles S.E. by S. of Vigia point, is a clean and capacious port, open to the south-east, with a depth of 6 to 18 fathoms and good holding ground; it is about one mile wide, and extends 5 miles N.N.W. $\frac{1}{2}$ W. in the direction of Tetas de Kataingan. The shores of the port are fringed with reefs and shoals to the distance generally of one to 3 cables, but on the eastern side three-quarters of a mile within the entrance point, a broad rocky ledge covered by one fathom only, extends westward from the coast to the distance of $4\frac{1}{2}$ cables. The upper part of the bay is shallow to the distance of two-thirds of a mile from its head.

Badlay island lies three-quarters of a mile S.S.E. of Dumurug point, on the east side of the entrance, and is surrounded by a shoal 4 cables wide, which extends as a ledge of sand and rocks from Badlay island towards Bugtun island for a distance of $1\frac{1}{2}$ miles, with a breadth of $2\frac{3}{4}$ cables; the depths on the outer end of the ledge are 19 to 26 feet, but nearer Badlay islet for the distance of about $5\frac{1}{2}$ cables there are several rocks with 3 to 10 feet water on them. There is a depth of 6 to 10 fathoms in the channel between Badlay islet and the point.

Ordonez bank, covered by $5\frac{1}{2}$ fathoms, is a rock 20 feet in diameter, and steep-to, lying one mile S.W. $\frac{1}{2}$ W. of Dumurug point, and 4 cables from the western shore. The passage between this bank on the one side, and Badlay island and Dumurug point on the other, is one mile wide, and has a depth of 16 to 20 fathoms.

Anchorage.—The bottom of the port is rocky on the eastern side, and sandy on the western. The usual anchorage is half a mile south-east of the town of Kataingan at the northern end of the port in a depth of $4\frac{1}{2}$ fathoms.

Port Kataingan is the best typhoon anchorage in the vicinity, anchorage being off the bight on the western side of the bay, about 3 cables northward of Mintag point.

Bugtun island, one mile in diameter, and 313 feet in height, is situated $4\frac{1}{2}$ miles southward of the entrance to port Kataingan, and one mile from the nearest coast of Masbate. It is encircled by reef to the distance of about one cable.

Balanguingue islet lies 2 miles southward of Bugtun, and about the same distance from the coast of Masbate. A sand bank extends from the islet towards Bugtun for a distance of $4\frac{1}{2}$ cables. Near the centre of the channel between these two islands there is a depth of 8 fathoms.

The channels between Balanguingue and Bugtun islands, and the coast of Masbate appear deep and clear.

ISLANDS BETWEEN MASBATE and SAMAR.—

The group of five islands, lying about midway between the southern part of Masbate and the coast of Samar, consists of Tagapula to the north, Maripipi to the south, with Talajit between them; and, eastward of the last named, the islands Kamandak and Limbankauayan. There are also several small islets near and amongst these larger islands; they are all high, clean, and steep-to.

Tagapula island, about 8 miles north-east of the entrance to Kataingan, is 6 miles long east and west, 3 miles wide at its western part, and rises to a height of 1,942 feet near its centre.

España shoal, of coral and rock, half a mile long north and south with a breadth of $11\frac{1}{2}$ cables, and having 9 feet water over it, lies about one mile N.E. from the middle of the eastern face of Tagapula.

Tides.—The flood sets to the south, and the ebb to the north; the tidal streams in the channels are strong.

Sibugay islet, half a mile northward of Tagapula island, is clean and steep-to, and rises to a height of 440 feet. The channel between is clear with a depth of 22 fathoms in the middle.

Talajit island rises steeply to a table summit 1,791 feet high. The islet Bagasipal is nearly connected with the south-west point. Tomas islet, 732 feet high, lies one mile east of Talajit; between the two are the smaller islets Maria and Arturito, with clear passages between them.

Kamandak island, is nearly circular, about 2 miles in diameter, and rises to a height of 1,400 feet.

Limbankauayan island has clean coasts, is steep-to, and rises to a height of 1,519 feet. Pilar islet, on the north-west side of Limbankauayan, is small, steep, and 168 feet high; on its west side a shelf juts out about a cable's length.

Maripipi island is a rounded mountain 2,092 feet high, covered with trees; the sides are clean and very steep-to. The islets Sambabuns, lying about one to two miles off the south-west coast, are four rocky islets close together, surrounded by a shoal of sand; there are rocks (Lajas) to the north of them.

BILIRAN ISLAND, on the northern coast of Leite, is about 19 miles long north-west and south-east, and 11 miles wide; it is high and mountainous throughout, and attains an elevation of 4,472 feet. The southern and south-eastern coasts are bordered by reefs which extend out half a mile.

Tagampul and three other small islets lie off the north-west point of Biliran.

Remus rock, 6 cables N.N.E. of Tagampul, of small extent, is covered by 13 feet least water; close to its northern edge the depth is 65 fathoms.

Biliran channel, separating the island from the north-west promontory of Leite, is 13 miles long, and has a general width of about $2\frac{1}{2}$ miles; at the southern entrance the channel becomes contracted to less than a quarter of a mile. In the middle of the narrow part of the south entrance there is the rocky islet of Poro, opposite to, and to the north of which stands the town of Biliran, with anchorage in front of it in a depth of 5 fathoms, mud.

The fairway lies between Leite and Poro, in which a depth of $2\frac{1}{2}$ fathoms can be carried by a vessel keeping within 50 feet of the south end of the islet. The passage here is but 150 feet in width, and this is reduced to a practical width of 100 feet, by a reef projecting across it from the Leite shore.

NORTH COAST of LEITE.—**Karigara**, a place of some trade, is a town of at least 8,000 inhabitants. There is a large municipal building surrounded by about twenty European-built residences, and a number of godowns and stores, the whole environed by nipe houses; there is a prominent building, either church or barracks, at the west end. Steamers touch there about once a fortnight.

It runs out shoal to the 5-fathoms contour-line, distant half a mile from the coast. There is anchorage in a depth of 7 to 12 fathoms at the distance of about 8 cables off-shore.

Barugo.—Off Barugo, about 3 miles north-east of Karigara, the depth decreases rapidly. Anchorage can be found in a depth of $7\frac{1}{2}$ fathoms, about one mile from the shore, with a large white storehouse bearing S. by E. A shoal point extends out about a mile from the western side of the town.

SAN BERNARDINO STRAIT.—San Bernardino strait, which separates the south-east extreme of Luzon from the north-west part of Samar, is so named from the small islet which lies in its eastern entrance. It was formerly the great highway for the Spanish galleons on their way from Manila to Acapulco in South America. The latest survey of the strait was in 1804, when Captain Don Juan Vernacci, commanding the *Magallanes*, constructed the chart between point San Miguel in Tikao and Katarman in Samar.

South point of Luzon.—From Tagiran point the coast trends eastward for 6 miles, forming a succession of sandy bays of no great indentation, with small streams emptying themselves into them. The depth of water in these bays is very great. The little port Bunut, east of Laugao point, is the outlet of a river which flows from a ravine between two high mountains. The depth at the mouth is 15 fathoms, and 4 fathoms further in; over the bar of the river the water is so shallow that boats can only enter at high tide.

Bunut point, on the eastern side of the port, is not so high as the adjacent land, but is distinguished by a table-top with a *cogonal* upon it; the other points are covered with trees to the water's edge. From this point to Babatgun point the coast is rocky.

Hamoraruan bank, about half a mile in diameter within the 10-fathoms limit, lies about half a mile southward of Bunut point, and is a danger in the track of vessels approaching the south entrance of Tiklin strait. The passage between the bank and the Luzon coast, as also between it and Kalantas bank, is in each case about 2 cables in width with the depth 10 fathoms and upward.

Babatgun anchorage is a semi-circular bay included between Babatgun point to the west, and Kulasi point to the east; on the western side of the bay there is a small sheltered creek, very steep, a depth of $4\frac{1}{2}$ fathoms being found at less than 12 yards from the shore. The west point of the bay is rocky, with a reef projecting to some distance from it. Care must be taken to avoid this reef as the flood tide from the Tiklin channel sets directly on to it. The depth of water between the two entrance points varies from 18 to 4 fathoms, while from the centre of the bay towards the above-mentioned creek the depths are 17 fathoms decreasing to 14 fathoms not far from the shore.

Kalantas bank, situated S. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles from Kulasi point, is formed of large black rocks and coral. The northern head is a flat rock about 70 yards in length, and 5 feet above water, with a depth of 8 fathoms near it; the depth increases at a short distance to the northward. The shoal extends south-east from the flat rock and at the distance of one mile the depth is 8 fathoms, rapidly increasing to the southward. The tidal

streams cause heavy breakers on the bank, giving it the appearance of a white sandy islet.

A rocky shoal, upon which there is a depth of 6 feet, lies one third of a mile N. by W. $\frac{3}{4}$ W. from Kalantas bank. The shoal is circular in shape, and about one-third of a mile in diameter.

Tides.—The tidal currents run with exceeding great strength near and over Kalantas bank, forming great eddies; they are reported to attain, at times, a rate of 8 knots.

Tiklin strait is the channel between the coast of Luzon and the islands Kalintan, Juak, and Tiklin. Although this channel is sufficiently deep, it is not safe for large sailing vessels on account of the tidal streams and eddies in it. The western shore of the strait, between Kulasi and Pandan points, is composed of broken coral covered by mangroves, and fronted by a reef half a mile wide, with a depth of $3\frac{1}{2}$ fathoms at the edge of it. Shelter may be found if required in Kulasi bay, which lies between Kulasi point and the island to the northward of it.

Matnok bay, about $1\frac{1}{3}$ miles in extent and open to the eastward, is fringed by a narrow reef with a depth of 3 to 4 fathoms near the edge; the plan shows a depth of 8 fathoms in the middle of the bay. On entering, care must be taken to avoid a rocky shoal covered by $1\frac{1}{2}$ feet at low-water, which extends one-third of a mile N.N.E. from the southern point of the bay. During easterly winds the bay is not safe, as a heavy surf breaks within it. The town of Matnok on the north side of the bay is poor, and offers few resources.

ISLANDS IN SAN BERNARDINO STRAIT.—**Tiklin islands.**—Kalintan, the southernmost of the group, lies half a mile south-east of Kulasi point in Luzon, is 2 miles in length north-east and south-west, and 358 feet in height; Juak, north-east of Kalintan, is only separated from it by a narrow channel: both islands are rugged and covered by ebony trees. There is a small detached rock about $1\frac{1}{2}$ cables distant from the south-east shore of Kalintan. Tiklin island, 220 feet in length, which gives the name to the group, lies $1\frac{1}{4}$ miles E.S.E. of Pandan point; a shoal projects from the south point half way towards the island Juak, which ends, about 6 cables south-eastward of Tiklin, in several rocks slightly above water, (the largest named Magtimua), with depths of $2\frac{1}{2}$ to 4 fathoms round them, leaving between the rocks and Juak a narrow channel fit only for small coasters.

Naranjos islands are a group of six, lying close together, about 7 to 12 miles to the southward of the south point of Luzon; they are named respectively San Andres, Rasa, Medio, Darsena, Aguada, and Escarpada; a seventh island, named Destacado lies $3\frac{1}{2}$ miles south-east of Aguada. These islands are mostly from 400 to 750 feet in height, and

rocky; their shores are rugged with occasional sand-beaches, and each island is fringed by a narrow reef projecting furthest from the salient points. The channels between them are clear and practicable for vessels of all sizes; but it is not safe for sailing vessels to use them, on account of the variability and strength of the currents, and the shifts of wind experienced among them. The depths between the islands are from 9 to 27 fathoms, so that a vessel could anchor in case of need, but the bottom is rocky; the best anchorage is N.E. of Rasa island.

There is said to be good anchorage for vessels of any size in the bight on the western coast of Destacado island, in a depth of from 6 to 10 fathoms. There is a reef near the middle of the bight extending about $2\frac{1}{2}$ cables to the westward, but by keeping near the western point on entering and anchoring in 10 fathoms large vessels may swing safely.

Kapul island, lying $3\frac{1}{2}$ miles S.E. by S. of Kalintan island, is about 7 miles long N.N.W. and S.S.E. and 2 miles wide; it is moderately high, the highest land being on the eastern side near the town Abak. On this part there are sand-beaches, but the remainder of the coast is rugged and steep, and it is not prudent to anchor near the shore.

LIGHT.—At the north extreme of Kapul island, a *group-flashing white* light is exhibited with a period of *thirty seconds*, showing *three flashes* in each group, visible from N. 36° W., through west and south to N. 29° E., at a distance of 18 miles in clear weather. The light is shown from a conical masonry tower elevated 48 feet above the ground, and 143 feet above high water. This light is reported to be a *fired light*, and also as unreliable (January 1901).

Anchorage.—At about the southern extremity of the island there is a little bay called Juban bay, with depths of 7 to 17 fathoms, which is probably the only place offering safe anchorage. On the west point of entrance there is a remarkable pyramidal rock which is useful as a guide.

Diamante shoal, lying $2\frac{1}{2}$ miles S.E. $\frac{3}{4}$ S. of the south point of Kapul, is 2 cables in extent, and composed of large boulders of rock with pinnacles covered by 9 feet water; it is very steep-sided, dropping suddenly into depths exceeding 20 fathoms. From the shoal, the west extreme of Kapul island is in line with the middle of the highest hills south-eastward of Bulan, and the south end of Escarpada island is in line with the north end of Aguada island.

Rubi shoal, about $1\frac{1}{2}$ cables in extent east and west, with a depth of about 6 fathoms on it (possibly less), and deep water close around, lies W. by N., distant $1\frac{1}{2}$ miles from Diamante rock.

Dalupiri island is low, wooded, and bordered by sand-beaches, with rocks close to them. A shoal, of sand and coral, with depths of less

than 5 fathoms on it, extends for a distance of 2 miles northward of the north point of Dalupiri, and has depths of 11 fathoms off it northward. A similar shoal extends southward from the south point of the island, the 5-fathoms limit being distant $1\frac{1}{2}$ miles, and the 10-fathoms line lying at the distance of 2 miles. Game is abundant, especially wild hogs. In the middle of the island there is a large lake swarming with alligators. The channel between Dalupiri and Kapul is 3 miles wide, and clear of danger, except Diamante rock in the southern approach.

SOUTH-EAST COAST of LUZON.—Bulusan town, 10 miles north of Pandan point, is situated on the shore on the right bank of a river which takes its rise on the eastern slopes of Bulusan volcano. The inhabitants number about 35,000. The shore is fringed by a reef to the distance of half a mile in places, with depths of 3 to 7 fathoms near the edge.

Bulusan volcano, distant 5 miles from the coast, rises to a height of 5,100 feet; it is a remarkable, active volcano, visible at a distance of 60 miles, and forms an excellent mark for making the strait. From the eastward it appears as a single peak, but seen from the S.S.W. it shows two peaks.

San Bernardino islet, from which the strait takes its name, is charted as lying about 6 miles from the coast of Bulusan; its actual position is reported to be 2 miles further East. It is 150 feet high, and covered with trees, many of which belong to the ebony tribe. There is a smaller islet close north-north-east of it, and rocks and foul ground extend half a mile south-east from the island. On either side there is a channel 5 miles wide, with depths of 30 to 60 fathoms. The chart shows a rock about one mile N.N.W. of the island.

LIGHT.—From a conical tower on the summit of San Bernardino island a *flashing* light is exhibited, showing one *red* and one *white flash* alternately every *fifteen seconds*; the light is elevated 178 feet above high water, 48 feet above the ground, and is visible in clear weather from a distance of 20 miles.

Gubat harbour, about 10 miles north of Bulusan, offers good anchorage for small vessels, except during south-east winds. In daylight the reefs on either side of the channel can be clearly seen, and the entrance may be approached boldly. After passing the edge of the eastern reef, a beacon formed of a barrel on a pole, painted white, kept in line with the white gate of the cemetery, bearing W.S.W., will lead to an anchorage in a depth of from 6 to 8 fathoms, mud. A pilot can be obtained if required. Merchant steamers touch at this port frequently. Gubat is a town containing about 9,600 inhabitants, and is a military

post. Water and supplies from the army commissary can be obtained by purchase. There are two good landing places here.

The coast between Bulusan and Gubat is fringed with reef to the distance of one mile, which on the northern side of Gubat extends out as far as 2 miles.

Montugan reef is a continuation of the great reef that fringes the shore, with but little break, from Bulusan to Montugan point; its most salient part projects 3 miles to the eastward about 6 miles southward of Montugan point. The channels in the reef are used by coasters working their way to the gulf of Albay.

Montugan point, the southern point of the gulf of Albay, and 13 miles from Gubat, is very low and sunken, and surrounded by shoals. A reef projects about 2 miles out from it to the north-east, with a depth of 5 to 10 fathoms at its edge.

NORTH-WEST COAST of SAMAR.—**Port Kanaguayan**, on the west coast, opposite the south end of Dalupiri island, is a small port in which vessels of all sizes can find shelter in bad weather. It is formed by an inlet on the coast, with two islets fronting it, leaving two narrow channels for entrance. The great pass, or Western channel, is $1\frac{1}{2}$ cables wide.

The anchorage is between the islets and the coast of Samar in a convenient depth, and good holding ground; but the space is confined. Water can be obtained from a rivulet opposite the first islet.

Coast.—Immediately south of Kanaguayan point the river Palanit runs down and enters a little cove, steep-sided, with a depth of 6 fathoms near the shore. Palanit point, the southern point of this cove, is high and jagged, and has an islet off it at a distance of 50 yards. From this point the coast trends S.S.E. for 7 miles to Malayog point; it is rocky as far as the intermediate point, Maglagabon, and from thence to Malayog point it is steep-to. The charts must be used with caution.

Mauo river, 4 miles N.N.W. of Kanaguayan port, has a rocky entrance, the channel lying close to the wooded bluff on the northern side. The depth on the bar is 11 feet at low water. The river is 100 yards wide at the mouth, but the available width is diminished to 25 yards by a reef from the south point, close inside which a shoal projects from the village on the north bank. Boats may water very expeditiously near a beautiful waterfall about one mile up the river. The anchorage outside is in a depth of 7 to 10 fathoms, with the village open of the bluff.

In this part of Samar the coasts form the base of a high range of mountains covered with trees of a very dark green. The hill consists of sand and rocks, covered with mangroves down to the water's edge. At a third of a mile from the shore the depth is 7 fathoms, sand and rock.

Borobodiangan point is covered with high trees; the shore between the point and Mauo river is bordered with rocks, in some places to a distance of a quarter of a mile from the shore. The tidal streams, which run at the rate of $7\frac{1}{2}$ knots at springs and 4 knots at neaps, strike the point with great force, producing violent eddies.

Lipata point, $3\frac{1}{2}$ miles north of Borobodiangan is high and rocky. A reef of sand and rock covered by 5 feet of water, projects from the point. There is good anchorage during the N.E. monsoon in the open bay of Tinaguitan, between points Borobodiangan and Lipata, the depth of water in the northern part is from 13 to 27 fathoms; and in this same part of the anchorage there is a good stream from which water may be obtained.

Balicuatro point, the N.W. point of Samar, is clean and steep-to to the northward, while to the southward and westward the shore is bordered by rocks to some distance out. Mount Lipata, 2 miles south of Balicuatro point, rises to a height of 725 feet.

Balicuatro bay, to the eastward of the point is deep, and the shore is steep and fringed here and there with rocks. In a cove 5 miles south-eastward of Balicuatro point, there is good anchorage in 5 to 10 fathoms, mud, sheltered in both monsoons.

BALICUATRO ISLANDS, northward of the N.W. point of Samar, have not been surveyed, and are imperfectly delineated on the charts; the channel between Vari and Barin islands is deep, but affords no anchorage, and the current is often very strong, with eddies.

Vari island, 5 miles north-east of Balicuatro point, $5\frac{1}{2}$ miles long north-west and south-east and 3 miles wide, is a chain of islands connected by reefs bare at low water; its shores are clean and steep-to, except on the north-eastern part, and to the south and south-east where a reef extends out three-quarters of a mile. A detached rock lies to the north of Vari island, half a mile off. Irregular depths of 7 to 36 fathoms extend to 20 miles east of Vari island. The bottom is rocky, and the tidal streams strong, so that vessels anchoring there are liable to lose their anchors.

Kinamaligan is low and surrounded by a reef; the channel between this island, and the reef off the coast of Samar is one-third of a mile wide and has a depth of from 5 to 15 fathoms; there is a 3-fathoms shoal in the middle of the western entrance.

Kabaun, the easternmost of the Balicuatro islands, is low, wooded and surrounded by reef which extends to more than a mile from the shore. There is anchorage between it and the coast of Samar, completely sheltered, but, at the same time so surrounded by islets, dangers, and sand-banks that it is difficult of access. The channels leading to it are only known to the local pilots; the depth in mid-channel is not less than 5 fathoms.

Katadman anchorage, 20 miles eastward of Balicuatro point, may be used during the S.W. monsoon, and a good berth found in a depth

See chart, No. 2,577 [2,656].

of 10 fathoms; during the N.E. monsoon a very heavy sea sets in. The town of Katadman, on the left bank of the river of the same name, contains a population of 8,200; it may be recognised by a large white roof showing above the trees along the beach.

The coast of Samar is very foul to the eastward of Katadman. The islets Hirapsan and Palijon 4 miles from the coast, are nearly united to it by a reef which continues along the coast as far as Oot point. Sunken rocks, upon which breakers have been seen, are situated 3 miles S.W. $\frac{3}{4}$ W. from Kajoagan island. From Livas point, 4 miles east of Oot, there are rocky islets covering a distance of half a mile to the northward.

Laguan bay between Livas point and the western side of Laguan island, offers good anchorage in 4 to 7 fathoms, sheltered from east and north-east winds, but exposed to the north-west and west. The south-eastern part of the bay is rocky.

Laguan island is separated from the coast of Samar by a narrow channel which communicates with port Palapa. The town of Laguan stands on a slight eminence on the south-west shore, and has a population of 8,800. A reef stretches out 6 cables from the middle of the western shore of Laguan island; in order to avoid this danger, when entering or leaving Laguan bay the islet off the north-west point of Kahayagan island should be kept bearing eastward of north until the reef is passed.

Kahayagan island is surrounded by rocks which extend out to the distance of 7 cables from its north-west part. A dangerous reef, with a depth of 2 fathoms, lies in the approach to Laguan bay, from which the islet off the north-west point of Kahayagan island bears N. 85° E. distant about 3 miles.

PORT PALAPA, formed by the channel that separates the islands Laguan and Kahayagan from Batag island, is about a mile wide, sheltered from all winds, and carries a depth of water varying from 5 to 10 fathoms, bottom sand and mud. The reefs and shoals that fringe the shores are steep-to. The northern entrance is 6 cables wide and 12 to 23 fathoms deep between the reefs on either side; the eastern entrance is of the same width, with a depth of 12 fathoms. The channel between Laguan and Kahayagan island has a depth of 4 $\frac{1}{2}$ fathoms, but is too narrow to be navigable by vessels of any size.

Within the port, on the coast of Batag there is an open bay with two shoals in it lying north and south between the entrance points; these shoals are steep-to, with a depth of 5 $\frac{1}{2}$ to 7 fathoms near them. Kalapan islet is surrounded by rocks, and from this islet the Laguan shore is bordered by reefs as far as Nakopot point. South of Batag island are many coral patches; one patch with a depth of 5 feet over it, lies about 4 cables from the Batag coast, with Nakopot point bearing S. 21° W. distant 9 cables.

In the channel between Batag island and Laguan island, there is an uncharted reef, with a depth of 5 feet, upon which the U.S.S. *Arayat* grounded in August 1901; its position has not been reported, but the soundings before the ship struck were 7 fathoms, as marked on the chart.

Anchorage.—Vessels can anchor anywhere inside the port, in a depth of 6 to 10 fathoms. If intending to anchor off the entrance of Kalomatan river on the eastern extremity of Laguan island, care should be taken to well open the mouth of the little channel ($3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms deep) that leads to it, until the shore reefs of the river mouth can be seen. Before entering this channel with vessels of any size, it would be well to buoy the shoals. On the main coast south of the channel there is an inlet with several little islets in it.

Good water can be obtained from Laguan island.

Tides.—In port Palapa it is high water, full and change, at 7 h.

Batag island.—The north coast of this island is fringed by a reef which extends half a mile westward into the north entrance channel. A reef projects 4 cables to seaward from the south-east point, narrowing the eastern entrance. The remainder of the outer shore of the island is clean.

Bakan island, 3 miles east of port Palapa, is high, and appears to be clean and steep-to. It is separated from the coast of Samar by a channel 2 cables wide.

Winds in San Bernardino strait.—The S.W. monsoon generally begins in the strait of San Bernardino about the middle or end of April, with winds from S.W. and West, which at times blow fresh, and alternate irregularly with N.E. winds. They are first felt in the part included between Verde island passage and the meridian of Marinduque island, and in this part they blow stronger than the variable winds from north to south, through east, that are experienced further to the eastward, and which are accompanied by thick weather and heavy squalls.

In April and May the winds are variable from north to south, through east, with thick weather, rains, heavy squalls, and occasional calms; this weather continues through June until the S.W. monsoon becomes established in the neighbourhood of Verde island passage, having beaten back the N.E. winds.

In general the S.W. monsoon becomes established in all its force during June, and blows from S.S.W. to West, reaching at this time as far eastward as Marinduque island. These winds bring rain at Manila and the west coast of Luzon.

In some years the S.W. monsoon is limited to the few gales from the westward alternating with the variable breezes from the eastward, which facilitate entering the strait from the eastward. In other years it attains its full force in May, and in this case the S.W. winds are less permanent

from June to September, and are replaced by longer intervals of variable breezes.

The N.E. monsoon commences towards the end of September or beginning of October. During September the wind blows alternately from N.E., S.E., or S.W.; but with most persistence from S.W.; during the interval of change there are light winds, calms, and tornadoes.

During October, November, and the early part of December the monsoon blows with strength from north and N.E.; accompanied by thick weather and rains. This is the worst season of the year for navigating the strait, on account of the bad weather, and the occurrence of typhoons. After the middle of December the gales cease, and the winds blow strong from N.E., East, and E.S.E., with much thick weather and rain until the March equinox, from which time until the monsoon ends the winds vary from north to south, through east, sometimes blowing with force, and at other times light with variable airs and calms.

Typhoons occur at the change of monsoons, and especially at the commencement of the N.E. monsoon, and few years pass without one happening in October or November. The signs preceding these storms, and the description of them, will be found in Chapter I.; see page 18.

Tides.—In the absence of more definite information, the points on which the pilots are mostly agreed are: that in the channel the water begins to rise at about 2 hours after the moon is up; that the greatest rise and fall is 8 feet; that from the eastern mouth of the strait to about the meridian of Bondog the flood stream sets westward, and the ebb eastward; and that from that meridian to the Verde island passage, the reverse of this takes place. That, from the eastern mouth of the strait to the above meridian, the stream of flood runs longer than that of ebb in the N.E. monsoon, the reverse being found in the S.W. monsoon, and the opposite condition to this is found from Bondog westward, and finally, that the night tides are commonly higher than those of the day.

Tidal streams.—The flood-stream sets through the strait to the southward with great force, amounting sometimes to 8 knots an hour in the narrow passages between the islands, and causing strong eddies and overfalls among them. Within the strait it spreads out, following the passages between Samar and Masbate to the southward, and between Luzon and Masbate to the northward, losing its force as it advances westward and encounters the stream which has entered through the western channels.

A counter-current of no great width is formed on the north coast of Samar, which runs from west to east along the coast and rounds cape Espiritu Santo to the southward.

DIRECTIONS for SAILING VESSELS TAKING THE STRAIT of SAN BERNARDINO DURING the S.W. MONSOON.—From West to East.—To pass out to the eastward from a position south of Marinduque, a course should be steered to make the north-west point of Masbate island, to avoid being embayed with a south-west wind in the Boca Engañosa of Burias island. A mid-channel course should be steered between Burias and Masbate, and when the south-east point of Burias is passed steer a N.E. course to pass north of Tikao, giving San Miguel island off the north point of Tikao a good berth on account of the strength of the tidal streams near it. Having cleared this island, it is well to keep to windward in order to be able to anchor at San Jacinto if required, to await daylight.

If the wind is settled and the time of day suits, vessels should not anchor at San Jacinto, but steer for Andres island, the north-western of the Naranjos isles, and thence pass midway between Kapul island and the Tiklin islands, proceeding out of the strait between San Bernardino islet and Vari island off the coast of Samar.

If the S.W. wind is not settled, it is well to remain at San Jacinto until it is fixed, lest calms or light winds should leave the vessel at the mercy of the tides in the strait. The best time for leaving the port is at half-flood, for then a vessel is likely to get the first of the ebb when she is near Naranjos islands. In steering a course attention should be paid to the set of the tide.

If carried into the neighbourhood of Kalantas bank, it would be well to make for the coast of Luzon, where anchorage may be had, or to anchor on the bank in good time. The navigation of the strait requires great care, and an anchor should always be ready to let go.

From East to West.—When entering the strait from the eastward in the S.W. monsoon, a vessel should work to windward with the flood stream, and when this loses its strength, should make for the bank north-west or west of Vari island, where anchorage can be had on sandy bottom until the tide makes again. On weighing, a vessel should work according to the direction of the stream, so as to pass between Kapul and Dalupiri islands, or between this last and Samar.

If the tide should turn before a vessel has entered these passages she cannot do better than make for Tinaguitan bay, south of Lipata point, in Samar. Anchorage can also be had, if necessary, in the channel on either side of Dalupiri on a sandy bottom strewn with big stones.

The only danger to guard against at this part is the Diamante rock; this once passed, a vessel can take either the passage between Naranjos islands and Kapul, or between Naranjos and Destacado. This latter route

is the best, shaping the course then to pass round the north end of Tikao island.

WEST COAST of SAMAR.—The part of the coast between Balicuatro point, the north-west extremity of Samar, and Malayog point, some 22 miles to the southward, has been included in the description of San Bernardino strait. From Malayog point, the coast trends S.E. for 13 miles to Jibatan point, west of Kalbayok; this part of the coast is high and clear at a distance of one cable as far as Damita islet, when it becomes low, and foul ground extends out upwards of one mile off the entrance to Jibatan river.

Kalbayok town and anchorage.—The town is situated on the shore in a bend of the coast near the mouth of the river Kalbayok; its population in 1879 amounted to 15,200. The anchorage is opposite to the town, about a mile from the shore, in a depth of $3\frac{1}{2}$ fathoms, with the church bearing N.E. $\frac{1}{4}$ N. It is an open roadstead, badly exposed during the S.W. monsoon. Steamers from Manila call here fortnightly.

LIGHTS.—A *fixed white* light, visible seaward between the bearings E.S.E. and W.N.W., from a distance of 10 miles in clear weather, is exhibited at the south-east entrance point of the Kalbayok river.

A *fixed red* light is shown at Kalbayok from a tripod near the outpost at the northern end of the town.

Coast.—From Kalbayok, the coast trends S.E. for 25 miles as far as Katbalogan, and is broken up into bays with but little depth of water in them, and quite exposed to the S.W. winds. The rivers that flow into these bays can only be entered by small coasters at half-tide. Near the coast the water is shallow, in no place exceeding a depth of $4\frac{1}{2}$ fathoms; a few islets and banks that lie off it are separated from the shore by shallow channels.

THE LIBUKAN ISLANDS are a group of three islands and several smaller islets lying about 4 miles off the coast of Samar. There is good anchorage in a bay on the north side of the largest island, Libukan dako, in a depth of 12 fathoms, and vessels on the coast make for this anchorage when the S.W. gales, called *collas*, begin to blow. The Uarai Vaoa rocks, awash, lie 8 cables south-west of Libukan gutiay; Lunod rock is a danger lying 7 cables S.S.W. $\frac{1}{2}$ W. of Tinangasan point, Libukan dako island.

Two islets named Laya laya, united by a reef which dries at low water, lie one mile south-east of the largest island.

Bapdap rock.—In the *Spanish Derrotero del Archipiélago Filipino* 1879, a rock awash, named Bapdap, is stated to exist at a distance of about 9 cables south of Laya laya islets, but it is not shown on the Spanish charts, and near the position a depth of 12 fathoms, rock, is given on the English charts.

About half a mile south-westward of the above spot, however, the U.S.S. *Panay*, in July 1900, observed a reef, awash in two places, with the depth of a few feet only in the intervening space of about 50 yards. The reef lies about $1\frac{1}{2}$ miles S.S.W. of Laya laya islets, with the east point of Libukan island bearing N. 6° E., distant 3 miles; and the east point of Kanahauan dako S. 58° E. A depth of 7 fathoms was obtained around the reef at the distance of about a quarter of a mile.

The ground in the vicinity is evidently very irregular, and being very imperfectly surveyed, must be navigated with great caution.

Kambidsos rocks lie one mile north of the largest Kanahauan island, and $1\frac{1}{2}$ miles N.W. by W. from Kanmamot island, 203 feet in height.

THE KANAHAUAN ISLANDS offer good anchorages among them, sheltered from all winds in depths of 15 to 20 fathoms. The best anchorage is in the little port of Aguirre, on the east side of Timpasan island, and near the south-west point of Kanahauan dako. The southern entrance to this port is one cable wide, and from 7 to 12 fathoms deep: the northern entrance is only $2\frac{3}{4}$ fathoms deep. The port itself is about 2 cables wide, with a depth of 7 to 10 fathoms in the middle, and 2 to 3 fathoms near the shore.

As these islands lie but 12 miles from Katbalogan and 15 miles from Kalbayok, both towns on an open coast, port Aguirre affords an excellent harbour of refuge for ships at those places.

The passages between the islands and banks that compose the group are safe and deep, and afford easy access to these anchorages, which is a fact, all the more important in that the neighbouring coasts have no harbours. The summit of Kanahauan dako is 498 feet high, and that of Timpasan 489 feet; the other islands are about 200 to 390 feet in height. They are all covered with large trees, which the natives are now clearing away, and replacing by plantations of *abaca*.

Buri island, lying 3 miles north-west of Katbalogan, is only separated from the coast of Samar by a channel less than one fathom in depth. There is anchorage on the eastern side of the island at the distance of 2 or 3 cables from the shore, in a depth of 3 to 5 fathoms; and also on the north side of the island at 3 cables from the shore, with the summit of the island bearing S. 27° E. in $4\frac{1}{4}$ fathoms.

The two Kagdullon islands standing on the same reef, 8 cables long E.N.E. and W.S.W. and 3 cables wide, are situated $1\frac{1}{2}$ miles west of the south end of Buri island; the Marisan and Kandogos reefs lie between.

KATBALOGAN, the capital of the province of Samar, is a large and important commercial port, standing on the shore of a little bay at the mouth of the river of the same name. It is a regularly built town of about 6,700 inhabitants, with a sea-face of half a mile, and carries on a fair trade with Manila, chiefly in hemp and cocoanut oil. The total population of

the island of Samar in 1899, was estimated by the Philippine Commissioners to be 200,753. The bay, which is open to the S.W., has a depth ranging from 3 to 5 fathoms, and is fronted by the shoals Lutao, Kinituai, and others, which lie distant from $2\frac{3}{4}$ miles west to nearly 2 miles S.W. by S. of the church in the town; these shoals dry at low water, and between them and the main coast there is a passage to the southward $4\frac{1}{2}$ fathoms deep. Steamers call fortnightly at Katbalogan.

The mouth of the river is obstructed by a bar which only allows ingress at high-water to vessels of not more than 6 feet draught.

Telegraph cable.—A submarine cable is laid to Katbalogan and is marked by a red buoy with staff and cage, showing where vessels should not anchor.

Light.—A *fixed red* light is shown at Katbalogan from the army head-quarter building.

Lutao reefs, situated in the approach to Katbalogan are just awash; the reefs, with the bank upon which they stand within the depth of 4 fathoms, occupy a space $1\frac{1}{2}$ miles in length east and west, and a quarter of a mile in width. A large beacon marks the northern side of the north-western reef, which lies $2\frac{3}{4}$ miles west of the middle of the town. On the south-western end of the eastern reef, there is a tripod-beacon, surmounted by a cylindrical day-mark, 20 feet high, and painted in red and white chequers.

Pamuntangan reef, 3 cables in length east and west with a breadth of one cable, lies with its outer end $6\frac{1}{2}$ cables westward of the south end of Katbalogan.

Darajuay islands, lying about $1\frac{1}{2}$ miles S.S.W. of Katbalogan, are two islands forming with Kinituai reef to the north-west, a chain $1\frac{1}{2}$ miles long N.W. $\frac{1}{2}$ N. and S.E. $\frac{1}{2}$ S. and 4 cables in width.

Anchorage.—The most convenient anchorage is about $3\frac{1}{2}$ cables from the shore, in a depth of $4\frac{1}{2}$ fathoms, with the southern pier bearing E. by N. and Jesus point N.W. $\frac{3}{4}$ N.; in the south-west monsoon an unpleasant sea is said to set in.

In bad weather vessels can proceed by the passage between the shoals and the shore to a more secure anchorage, in a depth of 5 to 7 fathoms, under the islands Darajuay and Majaba, which lie $1\frac{3}{4}$ miles and $3\frac{1}{2}$ miles, respectively, southward of the town.

Tides.—It is high water, full and change at Katbalogan, at Oh. 21m., rise of tide 3 to $6\frac{3}{4}$ feet.

Maqueda bay, the great indentation south of Katbalogan, is little known, it is shallow and only practicable for coasters. Majaba island at the mouth offers sheltered anchorage on its eastern side in 6 fathoms. A shoal awash named Kambalot lies between Majaba and Buad islands; there is a depth of 10 fathoms in the channel on either side.

See plan of Katbalogan, Buri, and Darajuay anchorages, No. 1,622 [2,664].

Daram, Parasan, and Buad islands.—Daram is 13 miles long N.N.W. $\frac{1}{2}$ W. and S.S.E. $\frac{1}{2}$ E., and 5 miles wide in its broadest part, narrowing to 2 cables only towards the middle of the island, thus forming bays on the east and west sides in which there is good sheltered anchorage. It is of moderate elevation, with hills of from 450 feet to 1,480 feet in height. The western shore is clean, and the rocky islets off it are all high except the one to the northward which only partly uncovers at low water. Parasan island, about $2\frac{1}{2}$ miles in length and of the same width, is almost attached to the eastern side of the north end of Daram, from which it is separated by only a very narrow channel.

Buad is somewhat circular, about $4\frac{1}{2}$ miles across, rising to a peak 1,155 feet high. There is a sheltered port on the southern side, with a depth of 4 fathoms. Zumarraga at the south-west end of Buad is sheltered by high hills, and with a roomy anchorage for vessels of deep draught. The passage, called Buad channel, between these islands and the coast of Samar, is very narrow, and is only used by coasters going from Biliran island to Katbalogan. A 5-foot knoll, marked on its eastern side by a buoy, lies E. by S. $\frac{1}{2}$ S., distant about one cable from the south-east point of Aokon island. A small coral patch with a least depth of 6 feet over it lies in Buad channel, about $3\frac{3}{4}$ cables north-westward from Liogliog point.

SAN JUANICO STRAIT, which separates the islands of Samar and Leite is difficult to navigate on account of the strong currents that run through it, and of the confined width, which in some places barely amounts to 2 cables. A number of little islets and banks still further reduce the width of the channel, the depth in which varies from $2\frac{1}{2}$ to 10 fathoms.

LIGHT.—A *fixed red* light is shown on Kananay, on the south side of Janabatas channel. It stands on supports over a grey shed 33 feet above high water, and 19 feet above the ground; it should be visible in clear weather at a distance of 7 miles, from N. 71° E. through south to S. 14° W.

Janabatas channel, the northern part of the strait, runs from west to east for a distance of 8 miles as far as Santa Rita island; the narrowest part, 4 cables wide, lies northward of Ivantakut, Kaltagan, and Navahay islands, and southward of Dabun island and the shoal flat extending eastward and westward from it. The depth in it is irregular, and varies from $2\frac{3}{4}$ fathoms north-eastward of Navahay, to 5 and 10 fathoms at the entrance of the next reach, which is more especially known as San Juanico strait. The velocity of the tidal streams in this part is about one knot, the flood stream sets to the west, and the ebb to the east.

Santa Rita island is high, clean on the south side, but surrounded on the other sides by a reef which extends furthest to the westward. The island may be recognised from Janabatas channel by a fort and houses

on it. From Santa Rita island the strait runs south for 12 miles to Panirugan point, at the southern entrance north of Takloban, and has an average width of 6 cables, reduced in some places to 2 cables, and carries a varying depth of 5 to 10 fathoms. A multitude of islands, islets, and shoals line the route and confine the channel. A rocky shoal lies 2 cables east of the rocky islet near the middle of the east coast of Nahabui island; there is also another rocky shoal, covered by $1\frac{1}{2}$ feet water, lying $2\frac{1}{2}$ cables N. by E. of the first shoal. The flood stream sets to the north, and the ebb to the south.

The southern entrance lies between the projecting point Panirugan in Leite, and the rounded point on the opposite coast of Samar to the northward; it is 8 cables wide and carries a depth of 6 fathoms. A long spit of sand and mud covered with from 3 to 10 feet least water, stretches from Kankabato bay on the south side of Panirugan point to a distance of 3 miles East of the point; and a large detached patch of sand covered by $2\frac{1}{2}$ fathoms, with a rock near the middle having only half a fathom water on it, lies on the northern edge of the spit, occupying the middle of the channel.

Takloban, the capital of Leite, a town of 7,000 inhabitants, stands on the south side of Panirugan point. It has two ports: port Panaluran on the north side of the point, offering sheltered anchorage in 3 fathoms; and Kankabato on the south side open to the eastward, and having a depth of not more than $2\frac{1}{2}$ fathoms in the deepest part near Kataisan point, about a mile S.E. of Takloban. Steamers from Manila trade fortnightly with Takloban.

LIGHT.—On the hill at Panirugan point, at the southern entrance of Juanico strait, a *fixed red* light is exhibited.

Pilots.—Strangers passing through San Juanico strait should employ a pilot. The pilots live on the point of land next eastward of Kananay island, and will come to a vessel if two long blasts on a steam whistle are sounded. They will take a ship through the strait drawing 20 feet. An anchor should always be ready for letting go.

SAN PEDRO BAY, included between Vigia point in Leite, and Capines point in Samar is of rectangular form, some 11 miles square, and contains several islets, besides banks and rocks imperfectly known. There is anchorage on the eastern side of the bay.

Vasey river flows into the northern part of the bay; the water of this river is said to be salt for 8 miles up the stream as far as some limestone rocks, 40 feet high, which forms a natural arch and picturesque grotto known as the *Cuevas de Sojotan*. The towns Pansiguikan and Basiao are on the shore 5 or 6 miles east of the mouth of the Vasey, and between these two towns stand some rocks, 92 feet high, water-worn

at the base, with rounded, wood-covered summits, looking like gigantic mushrooms. It is said that the natives used formerly to bury their dead in the rocky caverns of these islets.

Jinamok island, of moderate height, flat-topped, and surrounded by shoal water, lies south of the mouth of the river Vasey; the shore bank extends to $1\frac{1}{2}$ miles S.E. of the island. A shoal nearly half a mile in extent, with a least depth at its centre of $1\frac{1}{2}$ feet, lies 2 miles S.E. by S. of the southernmost point of the island, and one mile N.W. by N. from Panabulon island.

Islands and reefs in San Pedro bay.—Dio islet lies $1\frac{1}{2}$ miles S.E. of Kataisan point, and one mile from the nearest coast. Panabulon lies $3\frac{1}{2}$ miles E. $\frac{1}{2}$ S. of Dio, and has a shoal with a depth of half a fathom, extending to the distance of a mile S.S.E. $\frac{1}{2}$ E. from it; a 2-fathoms shoal is reported as being situated S. 63° E. distant 3 miles from Panabulon. Kamoropudan and Raso islets lie off the coast of Samar. Marakitdakít rock, about which there is no information, is shown on the chart 5 miles W. by S. of Capines point; a sunken rock with a depth of 12 feet over it lies about half a mile west of Marakitdakít.

Palos reef situated $3\frac{1}{4}$ miles S. by W. of Dio, is a small patch on the west side of the bay, lying at the outer end of a $4\frac{1}{2}$ -fathoms spit, projecting nearly $1\frac{1}{2}$ miles E.N.E. from the mouth of Palos river.

Egbert shoal, 2 cables in extent, with a depth of 2 fathoms over it and 10 fathoms around, lies in the fairway to San Juanico strait, and is situated with Palos reef bearing N. 85° W. distant 3 miles, and Dio island N. 32° W.

The east coast of Leite from San Pedro bay to the southward is described with the strait of Surigao in Chap. VII.

See charts, Nos. 2,987 [2,663] and 2,578 [2,648].

CHAPTER IX.

EASTERN COAST OF THE PHILIPPINE ISLANDS; NORTH AND
EAST COASTS OF LUZON; EAST COASTS OF SAMAR AND
MINDANAO.

VARIATION in 1902.

North and East coasts of Luzon	-	-	0° 20' E.
East coast of Samar	-	-	0° 40' E.
East coast of Mindanao	-	-	1° 0' E.

The information given in this Chapter is chiefly derived from the Spanish
Derrotero of 1879.

NORTH COAST of LUZON.—Cape Bojeador, the north-western extremity of Luzon, is about 300 feet in height, sloping down to its extreme point; it is surrounded by a reef which extends about $1\frac{1}{2}$ miles seaward and north-eastward of it, and to the southward beyond Dirikwi creek. The reef off this cape was struck by the s.s. *Centennial* when about 2 miles west of the lighthouse, the least depth obtained being 16 feet. Vessels should give this cape a good berth.

LIGHT.—From a truncated brick pyramid with white cupola, 65 feet in height, erected on a hill about a mile eastward of the extreme of the cape, is exhibited at an elevation of 360 feet above high water, a *flashing white* light with a period of *one minute*, visible seaward between the bearings of N. 14° E. and S. 56° W., from a distance of 26 miles in clear weather.

Current.—During the north-east monsoon a current of $1\frac{1}{2}$ knots an hour has been observed setting to the northward in the vicinity of cape Bojeador.

Coast.—From cape Bojeador the coast trends in a north-east direction 6 miles to Negra point, on the east side of which anchorage may be obtained during southerly winds. The deep bay between this point and Dialao point, 9 miles north-eastward, has also anchorage off Bangui, at the head of the bay. Dialao point, the eastern extreme of this bay, is fringed by a reef, and there is a shoal with less than 6 feet water about one mile south-west of Burayot point within Dialao point.

Mayraira point, the north extreme of Luzon, distant about 20 miles north-east of cape Bojeador, is fringed by rocks, and patches with $3\frac{1}{2}$ to

5 fathoms over them lie at the distance of a mile from the point. Lakaylakay point, bearing about E. $\frac{1}{2}$ S. 9 miles from Mayraira point, is a bluff steep point of white cliffs, having a mass of high land, called Patapat mountains, contiguous to it. To the eastward of Lakaylakay point there is a round hill of middling height, named point Pata. The whole of the coast from cape Bojeador to this place is steep; the land is of moderate height, and in some parts rather low close to the sea, with several rivers; but the country inland is mountainous. Strong eddies and tide rips are usually found in this locality.

From Pata point the coast trends south-eastward for 43 miles, and then north-eastward for 27 miles to cape Engaño, the north-east extreme of Luzon, forming a large bay. Fronting the sea is a considerable space intersected by rivers. On the western side is the Abulug chain of mountains lying parallel to the coast and about 6 miles inland. There is a continuous beach along this coast with regular soundings.

At respectively 14 and 15 $\frac{1}{2}$ miles S.E. by E. from Pata point are the entrances of the San Juan Pamplona and the Abulug, two small rivers, with a low island between them. A sand-bank, the only known danger on the coast, and on which the sea breaks in bad weather, lies about 2 miles N. by E. of the bar of the Abulug, and fronting the point to the westward of the river. It extends 2 miles E.S.E. and W.N.W., and about one mile outside it there are depths of 35 and 40 fathoms, fine black sand.

RIO GRANDE DE KAGAYAN.—The entrance to this river is situated 14 miles south-eastward of the Abulug, and has good anchorage about 1 $\frac{1}{2}$ miles N.N.E. from its mouth. On the west side of the entrance a shoal extends out some distance northward. The point on the east side is known by the church and town of Aparri built upon it, abreast of which, or north from the church, is the best anchorage. The navigable channel is about one cable in width, and is frequently shifting; it is marked by bamboo buoys. The population of the town numbers about 10,000. There is a telegraphic station at Aparri.

Steamers from Manila call here fortnightly.

LIGHT.—At Linao point on the west side of entrance, a *quick-flashing white* light is exhibited, showing a flash *every second*, elevated 37 feet above high water, and visible in clear weather from a distance of 11 miles, between S. 58° E., through south, and N. 71° W.

The lighthouse is cylindrical, on a square base, 30 feet high, painted white and grey, with light-keeper's dwelling painted yellow.

The bar at the mouth shifts with the currents caused by the river and winds, but vessels drawing 16 to 18 feet can generally enter with safety. A day-mark on the western shore steered for bearing S. $\frac{1}{2}$ W., will lead up to the outer pair of buoys.

Pilots can be had by hoisting the signal, and they board vessels off the mouth of the river in a pulling boat, which has the letter P on the bow. A pilot should always be employed.

Anchorage.—There is good anchorage in the channel from the entrance to about 2 miles above it in about $3\frac{1}{2}$ to 4 fathoms. A depth of 16 feet can be carried up the river for 10 miles. The tide ebbs and flows as far as the mouth of the Rio Chico, about 30 miles from the sea, to which place 6 feet water can be carried.

During the rainy season, August to December, the river is navigable for light-draught launches for upwards of 100 miles, but the current is strong and the channel continually changing. At times freshets occur that cause the river to rise several feet in a few hours, when it is not safe to remain anchored in the river. The water is sometimes discoloured for a distance of 10 miles seaward from the river's mouth.

Tides.—There is a regular ebb and flow, the ebb running at the rate of 2 knots during observations made in the month of January; at times it is probably stronger. The tides off the mouth of the river are irregular and strong. At times there is an undercurrent setting in the opposite direction to the surface current.

Palaui island, 5 miles in extent and moderately elevated, lies contiguous to the north-western point of the large promontory which forms the north-eastern extremity of Luzon; the port of San Vicente is formed between Palaui and the coast. There are outlying rocks off the western shore of the island which terminates southward in the high wooded bluff of Puerto point; a reef projects $1\frac{1}{2}$ miles from its eastern side, the edge of it being about half a mile from, and around the small high and wooded islet Escucha.

Cape Engaño, 54 miles E. $\frac{1}{2}$ S. from Pata point, is the north point of Palaui island. The two Hermanos islets lie off this cape, and there are some rocks off the north-east point, one mile East of cape Engaño; at the distance of half a mile in the same direction, lies the islet Gran Laja, a low rock about 2 cables in extent.

LIGHT.—From a lighthouse on the summit of the hill above cape Engaño is exhibited a *group-flashing white* light, showing two flashes in quick succession every *thirty seconds*, and visible from the bearing of N. 61° E., through south, to N. 49° W. It is elevated 316 feet above the sea, 47 feet above the ground, and should be seen in clear weather from a distance of 24 miles. Reported irregular, 1900.

Rocks.—Mr. F. Petersen, master of the British barque *Vale of Doon*, when rounding cape Engaño in July 1898, observed two rocks, the outer of which stood about 20 feet above the sea. From it Escarpada point bore about S.E. by S., and Gran Laja W. by N., distant $2\frac{1}{2}$ miles.

These rocks were not seen by the captain of U.S.S. *Samar*, July 1900, though that vessel passed several times close to their assigned position.

Port San Vicente, 30 miles E. by N. $\frac{1}{4}$ N. of Aparri, is formed by a small island of the same name standing on shoal ground extending eastward from the south end of Palaui island, and the mainland of the north-east end of Luzon. There is room in this port for three or four ships sheltered from all winds, in a depth of 4 to 5 fathoms, mud; the shore is fringed by reef to the distance of about 2 cables. It is an excellent typhoon harbour, and the only thoroughly protected one in northern Luzon.

The channel to enter, in which there is a depth of $6\frac{1}{2}$ to 15 fathoms, lies between the rock in the middle of the entrance covered only by 3 feet water, and the shoal extending eastward from San Vicente island, which uncovers one to 2 feet in places. Two temporary bamboo buoys marked the ends of the rock, and a similar buoy was in place on the point of the San Vicente spit in January 1900; the passage between the buoys marking either side of the channel is clear.

Directions.—To enter the inner harbour, steer in with the south-east extreme of Palaui island in line with Roña island (low and wooded) bearing N. 41° E.; or, with two small trees at the water's edge within the south-east extreme of Palaui island (the trunks and branches of which have been painted white) in line with a conspicuous high tree with a bushy top lying behind them, bearing N. 26° E. When the large dead tree on the point east of the middle of San Vicente, is in line with the west slope of the western notch in a long high mountain behind it bearing S. 51° E., steer N. 51° W. with that mark on astern, and anchor with the north end of San Vicente island bearing about S. 66° W. In the absence of buoys or marks on the reef on the western side of the channel a boat should be sent ahead to anchor on its extreme point. A current at the rate of 3 to 4 knots an hour may be expected off this point.

The eastern entrance to port San Vicente is considered dangerous, and certainly should not be attempted by vessels of any size.

Anchorage.—There is good anchorage outside the port in a depth of 7 fathoms sheltered from all winds but those between West and S.W., with the two small white trees before mentioned in line with the high conspicuous tree, N. 26° E., and the southern point of San Vicente island N. 50° W. This anchorage is used by steamers when the weather is too bad for them to enter the Rio Grande de Kagayan.

There is also anchorage along the coast between Aparri road and this place, in a depth of 15 or 20 fathoms water within 2 miles of the shore; the soundings are pretty regular, excepting at a depression in the bank about 10 miles S.W. of San Vicente, where the depths are 70 to 80 fathoms about $2\frac{1}{2}$ miles off shore, having close to the edge of it 30 fathoms, black sand.

See plan of port San Vicente on chart, No. 2,454 [2,670].

Trueno shoal, which lies three-quarters of a mile South of San Vicente island, does not uncover. The south-east point of Palani island kept open eastward of the south point of San Vicente island will lead to the south-east of it. The currents in this locality are rather strong.

Bank.—One mile northward of Escarpada point there is a bank of some extent, covered by 7 to 10 fathoms; bottom sand and rocks.

Douquay Trouin shoal.—According to the statement of M. Denier, master of the French bark *Douquay Trouin*, a shoal was passed on the 28th of May, 1875, N.E. of Luzon island. When sighted it was awash. It extended in a south-west and north-east direction, thence trending north-west for about 100 yards. The vessel passed within a distance of 2 miles, going 6 knots an hour. M. Denier places the shoal in lat. $19^{\circ} 5' N.$, long. $124^{\circ} 43' E.$

Anson or Clare reef.—Information is wanting about this danger, which is shown on the charts as being in lat. $17^{\circ} 40' N.$, long. $124^{\circ} 50' E.$

Directions.—The channel between cape Engaño and Kamiguin island to the N.N.W. is 20 miles wide, and clear of danger. As the currents set strongly to the northward in the south-west monsoon, it will be prudent for those proceeding eastward from this coast with light winds to keep on the south side of the channel, to prevent being drifted northward near the Guinapak and Didikas rocks, which lie north-eastward of Kamiguin.

NORTH-EAST COAST of LUZON.—From San Vicente the coast trends East for 5 miles, bordered by a narrow reef with detached rocks, to Escarpada point, the north-east point of Luzon, which has been usually distinguished, both in charts and sailing directions, as cape Engaño. Here the coast turns abruptly south-eastward for 12 miles to Iligan point.

From Iligan point the coast again turns abruptly to the S.S.W.; and then curves gradually round to the southward and south-eastward, to the headland of Moises, which bears S. $\frac{1}{2}$ E., distant 64 miles from Iligan point, and is formed by the eastern slopes of mount Moises. The coast in this wide bight is high and clean, but offers no shelter.

Three mountains, the respective heights of which are 2,086, 3,451 and 3,995 feet, rise to the southward of cape Engaño, at the distances of 11, 16, and 22 miles respectively, and must be good landmarks in clear weather. Mount Moises, another of the range of mountains which traverse the north-east part of Luzon parallel to the coast, is 4,209 feet high, and is a good mark for the ports in its vicinity.

Divilakan bay, north of mount Moises, is open to the northward; the shores are fringed by reefs, and there is a depth of 7 to 9 fathoms in the bay. A shoal extends north-eastward nearly a mile from Gay island

off the eastern point of the bay, and a second shoal, 2 miles long, extends due north just outside of Gay island. The anchorage is fairly well protected by the reef, and is reasonably safe, though exposed to the north-east monsoon.

The little port, Dimalansan, south-east of Divilakan bay, penetrates 2 miles to the south; its depth generally is 3 to 4 fathoms, but only $1\frac{1}{2}$ fathoms at the entrance, which is about one cable wide.

Port Bikobian, south of Dimalansan, penetrates 2 miles to the north, and is $2\frac{1}{2}$ cables wide and 7 to 11 fathoms deep. It forms a completely land-locked harbour, with soft sticky bottom, and would be perfectly safe as a typhoon anchorage. There are two shoals near the western bank half way up the bay; also several large rocks near the western side of the entrance, close inshore.

Paranan or Palanan bay, E.S.E. of mount Moises, is semicircular in form, has great depth of water, and is free of dangers; but it is quite exposed to the north-east wind. A long sand beach borders the bottom of the bay, into which the Paranan river, and several small streams flow. Eastward of the mouth of the Paranan, a reef projects in a north-westerly direction for about half a mile, and affords protection to fairly good anchorage. Breakers extend eastward of Paranan point to the distance of about half a mile; this point is easily distinguished by the saddle shape of the high land. The Spanish survey ends here.

All this coast is reported to be charted from 4 to 8 miles too far westward.

EAST COAST of LUZON.—The coast between Paranan bay and Inaguikan point, 250 miles further south, has not been surveyed, and is very differently drawn on the English and Spanish charts. Some of the positions, as for example cape San Ildefonso, 80 miles from Paranan bay, is given on the Spanish chart 10 miles S.E. by E. of the position in which it is shown on the English chart.

The general trend of the coast is S.S.W., and it is stated in the Derrotero to be clean and very steep-to, and, with the exception of Prueba shoal, to present no off-lying dangers. The bays Dilasak, Baler, and Dingala are little known; they generally offer only bad anchorages, exposed to all the winds and sea of the Pacific ocean.

Between Paranan bay and Dinapiki point, a succession of open lights follow, with shoals here and there close in shore. There are a few sandy strips of beach in the bottoms of the bights, but along the points high hills rise precipitously from the sea; in many places great caverns have been worn in the face of these high rock masses. No shelter can be found along this stretch of 40 miles except for small native boats.

Dinapiki point is formed by a succession of six headlands, steep-to, and without beach.

See chart, No. 2,454 [2,670], with plans of ports Dimalansan and Bikobian.

Dilasak bay (port Tumango), is 10 miles wide between Dinapiki and Tarigtig points, and falls back a distance of 7 miles from the line joining those points. At the south-west end of the bay, in a bight penetrating 2 miles to the southward, there is good anchorage, here completely landlocked, in a depth of 5 fathoms, soft sticky bottom, which offers advantages as a typhoon harbour for vessels of moderate draught.

Detached rocks extend off the eastern entrance point of this bight for 2 cables, north-eastward, and at about one mile south-west of the point there is a dangerous detached reef, about one-third of a mile in extent, and awash at low water; there is a narrow passage between it and the shore in which the depth is 4 fathoms.

The passage westward of the reef is wide and clear, presenting no difficulty, with a depth of 6 fathoms close to the north-west end of the reef; the anchorage, in 5 fathoms, is off the south-west side of the reef, distant from it about $2\frac{1}{2}$ cables.

Hence, the bight shelves gradually to a depth of 3 fathoms at $2\frac{1}{2}$ cables from the southern shore line, while 4 fathoms can be carried within $1\frac{1}{4}$ cables of the western beach, except where two coral reefs, drying at low water, project out for the distance of about 3 cables. The rise and fall of the tide in this bight is about 8 feet.

The eastern bight of Dilasak bay is open to the north-east monsoon, and affords no shelter.

Cape San Ildefonso, the south-west extreme of a long, high, thickly-wooded peninsula forming the eastern side of Kasiguran bay, is reported to be charted about 11 miles S. 68° W. of its true position.

On the western side of the cape, about three-quarters of a mile from the extreme point, rocky ground extends to the distance of 3 cables.

Kasiguran bay is a deep inlet penetrating 15 miles north-eastward within the San Ildefonso peninsula; the northern end of the bay forms an oval-shaped harbour, completely landlocked, 7 miles long and 4 miles wide, having a depth in the centre of about 22 fathoms, whence it decreases slightly towards the shores. The northern side of the inner part of the bay, or harbour, is shoal to the distance of 3 cables, when it deepens rapidly; elsewhere the shore is steep-to. The harbour is free from dangers, affords excellent protection from all winds, and the anchorage is good, the bottom being generally soft clay or blue mud; the best anchorage is in the north-west end in a depth of 15 to 18 fathoms. Fresh water, containing organic matter but fit for boiler supply, can be obtained on the north-east side of the bay, near the mouth of a river, from a small mountain stream almost hidden by the surrounding trees.

The eastern shore of the southern part of Kasiguran bay is bold throughout, with the exception of the rocky ground near cape San

See chart, No. 2,454 [2,670], and plan of Kasiguran bay, 3,126 [2,671].

Ildefonso, previously described; the western side is not so deep, and shoals rapidly inside the depth of 20 fathoms.

The entrance to the upper part of the bay, or harbour, is half a mile wide and presents no difficulty. A sandy spit extends eastward nearly one cable from Sandy point on the west shore, and close to Bluff point, about a mile within the entrance on the eastern side, there is a patch covered by 2 fathoms. Wheeling peak, about 300 feet high, and $1\frac{1}{4}$ miles eastward of Sandy point, usually shows plainly against the higher hills in the background, and is useful for making the entrance.

Baler bay, lying south-westward of cape San Ildefonso affords anchorage at its southern part in a depth of 5 to 10 fathoms, fine sand, with river mouth open and bearing about South, at about 2 miles north-westward of Encanto point, the southern point of the bay. Rocks, dry at low water, project north-eastward upwards of a mile from the point, and westward along the shore for about the same distance. The town of Baler and its church stands back half a mile from the shore, and is hidden from vessels at the anchorage by trees. A low green hill lies a little to the westward of the anchorage.

The coast between Baler bay and Dingala bay trends about S.S.W. $\frac{1}{2}$ W., and presents but few salient features. A ledge runs out a short distance from Dibabayab point, and an islet lies close inshore in the bight between this point and Distoring point, southward of which latter lies Distoring islet. Half way between Distoring islet and Dikapinisan point there is another islet, and one mile off Dikapinisan point is the islet of the same name.

Agria point is bare. A range of peaks 3,000 to 4,000 feet in height, extends back north-westward from Agria point, and moderately high mountains, with no prominent peaks, run parallel to the coast.

Dingala bay is clean, with a depth of 22 fathoms in the middle of it, decreasing towards the shore. A rounded point projects from the west side of the bay, with ten islets off it on a reef, Los Carabaos, which extends $2\frac{1}{2}$ miles north and south; this reef has several rocks awash upon it, and a depth of 4 fathoms at the edge. In the northern part of the bay there is a creek sheltered from northerly winds, with anchorage in a depth of 7 fathoms at 6 cables from the shore.

The river Dumagas, which enters the bay 3 miles southward of Los Carabaos, has a depth of 5 feet on the bar; and Umirey river within Deseada point, has 6 feet on its bar.

When making Dingala bay from seaward, a distinctive mark for recognising the place is a conspicuous white band on the hills running down to the beach about 5 or 6 miles to the southward of Deseada point. Also the point just behind Los Carabaos is bare having the appearance at a distance of a broad white roadway leading down to the beach.

Dingala bay is reported to be charted about 10 miles north and $2\frac{1}{2}$ miles east of its true position.

Prueba rock, rising above water from a coral bank situated 2 miles from the main coast, and nearly west of the northern point of Polillo island, may be considered the only off-lying danger between cape Engaño and Inaguikan point.

LAMON BAY, comprised between Inaguikan point to the north-west and the land of Mambulao to the south-east, is protected from northerly winds by the islands Polillo and Jomalig. The little island Balesin lies in the middle of the bay. In the south-west part of the bay, are the islands Kabaleta and Alabat; these two last-named islands form with the coast well-sheltered anchorage, with good holding ground. It must be remembered that the coast here is very imperfectly known, and the bays along it have not been sounded out; the positions generally are reported to be inaccurate.

Polillo island rises in the centre to a mountain of moderate height with wooded slopes. The north coast is said to be clean and steep, but is little known, and is reported to be very inaccurately charted. The east coast is bordered with islands and dangerous reefs, but the west coast is clean, except before the port of Polillo, where a great reef runs out north-west 4 miles parallel to the coast, leaving a narrow channel leading to the port, in which the depth is about 14 fathoms.

There are several shoal places of 2 to 4 fathoms in Polillo harbour, with deep water close to them; they are not marked by discoloration. A shoal spot, easily visible, with 5 feet water over it, lies close to the eastern shore with Polillo point bearing W. by S. The reef to the westward is plainly discernible. When standing in for the harbour the shore must be closely hugged; vessels should feel their way slowly, and any shoaling of the water below 10 fathoms may be taken as an indication of the proximity of a shoal, having probably only 2 or 3 fathoms on it. The church in line with the centre of a round hill behind it, and midway between two high trees, bearing S.E. $\frac{3}{4}$ S., leads in with a least depth of $11\frac{1}{2}$ fathoms. The inner part of the harbour appears to be perfectly clear, with a least depth of 11 fathoms off the town.

The town of Polillo numbers 1,600 inhabitants.

Shoal.—In the channel between Polillo island and Luzon, about midway between San Miguel and Inaguikan point, there is a dangerous shoal with a depth of 9 feet over it. The best and widest channel is westward of the shoal.

Inaguikan point is low, but covered with a thick growth of coconut trees, about 40 feet high, that from a distance look like solid land. It is visible in clear weather 14 to 16 miles by day and 5 miles by night.

Port Lampon, in the north-west part of Lampon bay, is a small but well sheltered port, of a depth of 5 to 12 fathoms over a bottom of sand and mud. The shores, covered with dense vegetation, are commanded by the remarkable mountain, Binangonan; several rivers flow into the port, from which good water may be obtained. This place is celebrated in the history of the Philippines by having been, during a part of the 16th century, the depôt of the Spanish galleons and the treasures of Manila.

About 11 miles south of port Lampon, a rock about 40 feet in height lies a quarter of a mile off the shore.

Mauban bay lies about 33 miles south of port Lampon. Information is lacking about the anchorage at this place, but the town must possess some trade, as steamers call here. There is anchorage in a depth of 5 to 8 fathoms, mud, about a mile south-eastward of the town.

Antimonan, situated 10 miles south-east of Mauban, has anchorage off it in a depth of 10 fathoms between the points of the bay, beyond the line of which vessels should not pass. The point to the northward is strongly marked, and the town lies about three-quarters of a mile within it. There is a telegraph station at Antimonan.

ALABAT ISLAND is about 17 miles long, is densely wooded, and has a ridge of moderate height along its whole length, with four rounded peaks, which from a distance look like islands. The strait separating the southern end of the island is about a quarter of a mile wide, with a depth of $5\frac{1}{2}$ fathoms.

Alabat harbour.—The port of Barcelona on the south-west side of Alabat island, and about 8 miles north-east from Antimonan, Luzon, has accommodation for three or four small vessels of about 500 tons. It is formed by a bight in the coast, about a mile wide, and affords excellent shelter during gales from the northward and eastward. Long reefs of sand and rock extend off both points of the bight; midway between these reefs, and about half a mile from the shore, there is a detached reef which uncovers at low water.

The small town of Barcelona is on the eastern side of the port; its resources are very scanty. Drinkable water can be obtained from a small stream on the north side of the port, which boats can enter at high tide.

The most conspicuous building in the town is the convent, a large wooden building, painted white, with a galvanized iron roof. The convent bearing E. by N. $\frac{1}{2}$ N. leads to the anchorage, the depths decreasing gradually from 18 fathoms off the west point, to 3 fathoms at the distance of $2\frac{1}{2}$ cables from the shore.

There is reported to be a good typhoon anchorage at Kamagon, on the south-west side of Alabat island.

Tides.—It is high water, full and change, at Alabat harbour at about 4h. 40m., rise of tide $4\frac{1}{2}$ to 8 feet.

Baliskan island lies off the north-west end of Alabat; it is surrounded with deep water; vessels pass close northward of it.

Kabalete island is densely wooded, and has a general height of from 75 to 100 feet; a reef extends about one mile south-eastward from the south point.

Balesin island, about 2 miles long and nearly a mile wide, is low, flat, and wooded, its general height being about 50 feet. Close to the north-east end are two small islets, from which a reef extends north-eastward about three-quarters of a mile.

Tarlac reef, of coral, with a depth over it of 2 fathoms, is situated about 2 miles southward of Balesin island.

Jomalig, Manlanat, and Lantao islands are reported to be about 9 miles north-east of their charted positions; they are low and flat.

Port Mambulao, between Pinandungan point and the Dajikan islands, is safe, sheltered from all winds and easy of access. The depth of water diminishes gradually from 11 fathoms at the entrance of the bay to 2 fathoms before the mouth of a river at the head of the port. The number of fishing enclosures within the harbour considerably obstructs the navigation. The town of Mambulao, at the mouth of the river, is of slight importance; its population amounts to 1,400. This town and the neighbouring one of Parakale are famous for red lead ore found in the vicinity.

Tanao islets are five low flat islets lying 7 miles N.W. by N. of Pinandungan point.

KALAGUAS ISLANDS are a group of eight islands and several small islets, the largest and most central of which is Tinaga; they are mostly bordered by reefs, and are all of moderate height and not densely wooded. Anchorage may be found eastward of Makulabo, off the south-west part of Tinaga, and N. by E. of Parakale on the main coast. Water can be obtained on the east side of Makulabo. The group is reported to lie 3 or 4 miles further East than charted.

Dangers.—A rock, surrounded by a reef about 2 miles in extent, lies about 2 miles north-west of Pinagnapan island. Thurston rock, a small islet, lies about $3\frac{1}{2}$ miles north-westward of Samur island; a reef of rocks, some of which are awash at low water, extends $1\frac{1}{2}$ miles eastward of the islet, upon which the sea breaks.

Breakers have been reported as being seen about 4 miles northward of Thurston rock.

Matandumaten islet appears on the chart as being situated 10 miles S.E. of Kagbalisay, the easternmost of the Kalaguas islands; and, midway between these two, an islet is shown, with a rock off its southern side. Another small islet is also charted as lying 5 miles west of Matandumaten. Information is wanting about these islets.

Danger.—A great bank is shown on the charts as lying 28 miles N.E. by E. of the Kalaguas, stretching 20 miles W.N.W. and E.S.E. with 3 to 5 fathoms of water over it. No soundings are given in the neighbourhood of this bank, nor between it and the coast; but it is believed that the channel between the bank and the Kalaguas is deep.

COAST.—**Parakale** is a town of 2,600 inhabitants in a little bay 7 miles south-east of Pinandunguan point. Parakale point, the westernmost point of the bay, is low, covered by mangroves, and bordered by a reef. From Bakal point, the eastern point of the bay, the coast trends S. 62° E. as far as Indang point (Jindan), and is low and bordered by a beach, off which there is good anchorage.

Kinamanokan island, off Indang point, is low, flat, and bordered by sand beaches; it is separated from the coast by a channel 5 to 10 feet deep.

Daet river, which enters the sea 6 miles S.S.E. of Kinamanokan island, is 11 feet deep at the mouth, and has a depth of 16 feet farther up. When entering the river, the western shore, upon which stands a fort, must be kept aboard, as there is a reef off the eastern point which is low and covered by mangroves. Steamers from Manila call here.

There is a telegraph station at Daet river.

Kanimo and Kanton islands, situated at a short distance south-east of Daet river, are of moderate height; the south-east extremity of Kanton is a prominent bluff. Kanimo, which is the larger of the two, is about 2½ miles long, north and south; its shores are mostly surrounded by rocks, but on the north-east side there is anchorage on sandy bottom. Five small islands, named Rasas, lie to the southward and south-westward of Kanton island. The water in the neighbourhood of these islands is shallow.

Kolasi point, formed by the slope of Kolasi hill, is high; there is a little bay, with a depth of 3 fathoms, between the point and a peaked hill S.W. of it. The town of Kolasi, which stands on the northern slope of the hill, contains a population of 8,000, and must be a place of some trade as steamers call here.

SAN MIGUEL BAY.—To the eastward of Kolasi point the coast forms a clean circular bay, some 10 miles in diameter, surrounded by high mountains. When entering from the eastward care must be

taken to avoid the reefs off Pinitan point and Siruma island. The depth of water in the middle of the bay is 7 to 8 fathoms, lessening gradually towards the sides. The western shore between Kolasi point and Bicol or Kabusao river, at the bottom of the bay, is very low, and edged by a sandy beach with shallow water off it.

Kabusao (Bicol) river, which discharges itself through a low flat shore, is one cable wide, and $3\frac{1}{2}$ fathoms deep at the mouth; farther up it carries a depth of $2\frac{1}{2}$ fathoms throughout a length of 24 miles as far as the town of Nueva Carceres, of 7,300 inhabitants. A bank of sand, covered by 3 feet water projects 2 miles to the north-east from the mouth. Kabusao, on the left bank at the mouth of the Bicol river, is only a fishing village.

Three barrel buoys, painted white, mark the entrance to the river (November 1901). When entering, pass close to the outer buoy, leaving it on the starboard hand; then steer S.S.W. for the second buoy, which also pass close to on the starboard hand, then steer W. $\frac{3}{4}$ S. for the third buoy, passing it close on the port hand. These buoys are shortly to be replaced by iron buoys, the outer two painted red, and the inner buoy black.

Siruma point and island.—From Tangular point, 8 miles eastward of Kabusao, the coast rises and continues of moderate height as far as Siruma point; the depth of water off this coast is irregular, and some shoals and small islands lie near it. San Miguel islet, situated about 4 miles southward of Siruma island, has good anchorage south of it in a depth of 5 fathoms, soft bottom. Siruma point is connected with the small island close to it by a reef; another reef extends $1\frac{1}{2}$ miles west from the south part of Siruma island, at the end of which there is a rock, covered at high water, and steep-to on its western side. A reef also extends in a N.E. by N. direction from the north-east end of the island, for a distance of $1\frac{1}{2}$ miles.

THE COAST.—Siruma bay, eastward of the point, has depths of 7 to 9 fathoms, sand; from Pinitan, the northern point of the bay, a reef projects 2 miles to the north-west. Between Siruma bay and port Sisiran, the coast is bordered by islands and rocks; the several bays that it forms are foul, and accessible to fishing boats only. Batauanan, the northernmost island on this part of the coast, is high and surrounded by rocks. An islet off Tambang point is very prominent and a good landmark.

Kinalasag island, which forms the northern side of port Sisiran, is about 5 miles in length, moderately high, and clean on the side towards the port. Bakakay island and several smaller islets lie off the northern point, and from the northern part of Bakakay, a reef with rocks awash extends about 2 miles N.W. by N., in which direction broken water has

been reported at the distance of 5 miles from the island. A rock (Laja) on which the sea breaks lies $1\frac{1}{2}$ miles off the north-east shore of Kinalasag, in the approach to port Sisiran. Of the two passages on either side of this rock, that to the westward is the best; soundings show depths of 14 to 23 fathoms at less than a mile from Kinalasag.

Port Sisiran is clean and capacious, and has good anchorage sheltered by high ground. The entrance, open to the north, is $1\frac{1}{2}$ miles wide and has a depth of 10 to 12 fathoms near the point of Kinalasag, and 7 fathoms near the edge of the reef which surrounds the eastern entrance point to a distance of 2 cables. Within the port the depth of water decreases gradually from 10 fathoms at the mouth to 3 fathoms close in, bottom, sand and mud, near the shore. Water can be obtained on the eastern shore, but no provisions are procurable.

Tagun bay, east of port Sisiran, has not been explored.

Lahuy island is $4\frac{1}{2}$ miles long N.N.E. and S.S.W. Its north-western extremity terminates in a remarkable sharp peak like a sugar loaf higher than several islets which lie near it; the north-eastern point is bordered by reef to the distance of 3 cables.

At a distance of 4 miles N.W. of the Sugar Loaf, there is a group of four islets, the largest of which is 3 cables in length, with a reef projecting one mile to the northward from it, and surrounding two still smaller islets. The southern islet of the group lies 7 cables S.E. of the largest islet, and is clean and steep-to. The channel between these islets and Lahuy island is safe, and has a depth of 12 to 27 fathoms.

Coast mark.—The Sugar Loaf above mentioned makes a good mark for the entrance of port Sisiran for vessels coming from the eastward.

Karamuan port, situated at the foot of the highest mountain of this part of the coast, is very small, and has a depth of only $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms. The town of Karamuan is 4 miles inland, on the left bank of a river. Panahonga or Karamuan point, 4 miles east of the port, is high and steep, as also is the coast which trends S.S.E. from it for a distance of 7 miles to Bungus point.

Kanaguan islands, 2 miles east of Panahonga point, are small, low, and surrounded by reefs.

Taebun channel, between the above-named islands and point is clear, with a depth of 8 to 17 fathoms.

Anchorage.—Limited anchorage may be found in the first bay immediately south of Panahonga point, situated about west from the northern Kanaguan island. When making for the anchorage, pass along the northern shore at the distance of about a cable, until it trends sharply to northward, forming the northern bight; then head for some light grey

stones in the bank on the western shore just to the right of the western small bight. Anchor in $10\frac{1}{2}$ fathoms, muddy bottom, with the north end of Pitogo island (southern entrance point) bearing East, and the northern extreme of the Kanaguan islands N. 70° E.

In typhoon weather small ships should moor in the northern bight, with anchors off each quarter and the bow anchor well to the northward; the bight is not wide enough to permit swinging. The main bight is open between N.E. $\frac{1}{2}$ E. and E. by N., admitting considerable sea. Small vessels can anchor behind the reef in the western bight, but the channel round the reef to it is narrow and rocky, requiring great care; these vessels may also moor in the narrow southern passage immediately to the south-westward of Pitogo island.

The rise and fall of the tide here is about $4\frac{1}{2}$ feet.

Bungus point terminates in a group of three islets, detached one to 2 cables from the mainland; the northernmost islet is a rounded cone higher than the land immediately adjacent, the other two are low and smaller. The two islets Palombon, E.S.E. of Bungus point, are separated from the group of three islets by a channel $1\frac{1}{2}$ miles wide, in which the depth is 15 fathoms.

KATANDUANES ISLAND, separated from Luzon by Maqueda channel, is about 38 miles long north and south, and 20 miles in width, and is traversed throughout its length by a chain of mountains. It is abundantly supplied with small rivers, from the sands of which the natives obtain gold dust. The soil is fertile and produces rice, maize, sesame indigo, cotton, and abaca; and there is good pasture for horses and oxen. The population in 1879 was about 21,000.

The west coast is, in general, safe and steep; the east coast, bordered by little islets, presents some bays in which the anchorage is indifferent; and off the north coast there are various islets and shoals detached from the shore to a distance of 10 miles.

Katanduanes island, in common with the other islands off this part of Luzon, as well as the main coast itself, are imperfectly surveyed and charted; but the general relative bearings and distances along the coast are reported by Lieutenant A. T. Long, of the U.S.S. *Vicksburg*, to be tolerably correct, and he experienced no difficulty in locating the various headlands and islands.

Iot point, the northern extremity of Katanduanes island, is of moderate height and steep to. Matulin islet, 5 miles E. by N. $\frac{1}{2}$ N. of Iot point, is a rock in the centre of a small reef awash.

Horadaba islets, are three large rocks, about 40 feet high, lying about one mile north-west from Matulin islet with foul ground between.

See chart, No. 2,377 [2,656].

Abriop bank, shown on the chart as lying N.W. by N. 9 miles from Iot point, and as extending 3 miles from east to west with a breadth of one mile, has not been surveyed. It was not seen by a passing vessel in 1899.

The Palumbanes islands are a little group, consisting of an island about $2\frac{1}{2}$ miles long east and west, with an islet off the south-east point, and two other wooded islets off its western end, situated 4 to 7 miles west of Karao bay. A shoal upon which breakers were seen, is reported to be situated about $4\frac{1}{2}$ miles northward of the eastern Palumbane islet.

A rock, 10 feet high, lies about $2\frac{1}{2}$ miles S.W. by S. from the western Palumbane islet, and breakers have been seen about $1\frac{1}{2}$ miles south-eastward of this rock. A reef, awash, about $2\frac{1}{2}$ cables in extent, is also reported to exist about $1\frac{1}{2}$ miles S.W. by S. from the above 10-foot rock.

Karao bay, on the north-west part of Katanduanes island offers fair anchorage over a rocky bottom; there is no other anchorage on the west coast of the island.

Sialat point, on the south-west part of Katanduanes is high; rocks extend a quarter of a mile westward from the point. Agojo point, 5 miles south of Sialat, is low and covered by mangroves; a spit extends southward from it to the distance of one mile. From the latter point the coast trends S.E. by E. 8 miles to Taguntun point, and is high with little bays in it, which do not afford anchorage, except in front of Kalolbong, where the depth is 11 fathoms about half a mile from the shore, and can be obtained on shelving bottom. The town of Kalolbong has about 1,600 inhabitants. Pechili reef, the extent of which is doubtful, lies about one mile southward and eastward from Taguntun point.

Kabugao bay, on the south side of the island, is 9 miles wide between the entrance points, with a depth of 18 fathoms, shoaling gradually to 4 fathoms near the shore. The west point of the bay is low and bordered by rocks; from it a reef projects S.S.E. about a mile upon which the sea breaks heavily. The east shore from Nagumbuyan point to Kabugao is fronted by foul ground to the distance of nearly a mile, and the rest of the bay has banks and rocks extending out as far in places. At the north-west part of the bay stands the town of Birak, the most important on the island, with 4,100 inhabitants. Kabugao river, on the eastern side of the bay, is fronted by two islets, and has a bar which nearly dries at low water. The towns of Kabugao and Bato, each of 2,000 inhabitants, stand on the banks of the river.

St. John's reef, covered by about 4 feet water, and about one mile in extent, is a detached shoal lying from one to 2 miles eastward of the west point of the bay; Birak church, bearing N.N.W. $\frac{1}{2}$ W., clears St. John's reef to the eastward.

Tides.—It is high water, full and change, at Kabugao bay at about 6 hours, rise at springs about 6 feet.

East coast of Katanduanes.—Port Baras has a depth of 3 to 7 fathoms, but is obstructed by reefs which make the entrance difficult. Port Bagamanok on the north-east coast offers two anchorages. The southern anchorage is between the island Panay and Anajao point; the entrance which runs east and west, leads into a little semicircular bay, between two islets, having a depth of $4\frac{1}{2}$ to 7 fathoms. The northern anchorage is situated at the southern extremity of the narrow channel between the reef off Minigil point and the reef off Panay island, and, it has a depth of 17 fathoms, decreasing to 7 fathoms, sand, opposite the town of Bagamanok.

Winds on the east coast of Luzon.—From cape Engaño to the bay of San Miguel, N.E. winds prevail from October to March, the monsoon here beginning with north winds which are of short duration and soon pass into the north-east; in January and February the east winds begin, and terminate the monsoon. The heaviest rains fall from October to January, and in October typhoons sometimes occur. In March and April, and sometimes in the beginning of May, variable winds blow, bringing in the south-west monsoon; but the dry season, of which April and May are the driest months, is uninterrupted by rain.

Thunder storms occur from June to November, most frequently in August. During the south-west monsoon the sea is very calm, but in the middle of the north-east monsoon all navigation ceases on the east coast.

Tides.—The flood stream sets to the northward, both on the east and on the west side of Katanduanes island, and to the westward along the part of the coast between Katanduanes and Polillo island. There is little information as to the hours of high-water.

COAST of LUZON.—Lagonoy gulf has not been sounded, and its coasts are at present but little known; no dangers, however, have been reported on the direct route between Maqueda channel and Tabako bay in the southern part of the gulf.

Gijalo bay.—About 7 miles westward of Bungus point, and at the northern end of Lagonoy gulf, anchorage may be had in a depth of 22 fathoms, southward of Gijalo village, at a distance of 3 cables from the broad coral reef which fronts the head of the bay where Gijalo stands. From this position the extremes of the points of the bay bear respectively S. 75° E. and S. 54° W.

Shoals.—A shoal of considerable extent has been reported to the southward of Sharp peak on the north side of the gulf, which is charted as being 7 miles in length east and west; this shoal (if it exists) probably

joins a reef reported by the local pilots as of conical shape, and to project $4\frac{1}{2}$ miles in a south-westerly direction, from a small islet situated about $2\frac{1}{2}$ miles S.W. by W. $\frac{1}{2}$ W. from Sharp peak.

Alulayan island, lying off Sagnai point, is steep-to on its south and east sides, and being high is useful as a mark for vessels navigating the north-west part of Lagonoy gulf. The best typhoon anchorage in the gulf is westward of this island in a depth of 10 fathoms, soft bottom; to reach which pass about one cable from the southern end of the island and stand into the bight on the Luzon shore. The anchorage is fairly protected from the northward by outlying reefs, especially from the Luzon side. There is also anchorage off Sibang, the Visita of San José de Lagonoy, about 4 miles to the northward of Alulayan island in from 5 to 8 fathoms, sand, at the distance of about 4 cables from the shore.

A reef, about 2 miles in extent, has been reported to lie 3 miles eastward of Alulayan island, but its existence is doubtful.

Mount Isarog, which rises to a height of 6,462 feet between San Miguel bay and Lagonoy gulf, is an extinct volcano about 36 miles in circumference. Its eastern slopes reach nearly to the waters of Lagonoy gulf, while its western slopes are separated from San Miguel bay by a wide strip of alluvial soil. Mount Iriga, between mount Isarog and Albay volcano is 3,976 feet high.

Tabako bay.—The part of the coast that runs north-west of Tabako for 6 miles as far as Tibi point, a high bluff point, is bordered for a distance of $3\frac{1}{2}$ miles from the point to the southward, by a rocky reef extending out from the shore for upwards of 2 miles, upon which the depth is from 5 feet to 5 fathoms. This reef lies in the approach to Tabako bay.

Tabako bay, in the southern part of Lagonoy gulf, is fronted by the islands San Miguel and Kakraray, and is by them formed into an excellent and capacious harbour 6 miles long and 3 miles wide, with a depth near the shore of 5 to 9 fathoms. These two islands are connected by a reef, and Kakraray is only separated from Sulat point, the southern point of the bay, by a narrow, winding, and impracticable channel. The entrance to the harbour, between points Natunaguan on the main coast of Luzon, and Guinamban on San Miguel island, is $7\frac{1}{2}$ cables wide. The first of these two points is clean; but a reef projects to the north-west from Guinamban point, to a distance of one mile, continues round the north coast of San Miguel, and extends westward from it nearly half way across the entrance to Tabako bay.

Mulinao church bearing S.W. by W. $\frac{1}{4}$ W. leads southward of the reef lying northward of that town; a 5-fathoms patch in this channel was passed over by H.M.S. *Peacock* with the church bearing S.W. by W. $\frac{1}{8}$ W. The reefs on both sides are usually well defined.

The town of Tabako, in the north-west part of the bay, contains a population of about 17,000, and carries on a brisk trade with Manila, steamers calling three or four times a month. There is a telegraph station at Tabako. From Tabako the coast is steep with a depth of $4\frac{1}{2}$ fathoms close to it, as far as Bagakay, a town of 9,200 inhabitants, situated $4\frac{1}{2}$ miles S.S.E. of Tabako. Anchorage may be had anywhere between these two places, but the best is off Tabako, in front of the church. The edge of the bank off Tabako is very steep-to; it uncovers at low water and falls abruptly into a depth of about 19 fathoms.

There is an abundance of fish in this bay.

From Bagakay a reef stretches across the southern part of the harbour to Kakraray island, inclosing the islet Bugias (which is round and flat topped) and closing the northern mouth of the Sulat channel. Pilis bay is a lagoon some 5 fathoms deep, into which vessels of very light draught can enter at high water.

Tides.—The flood stream sets to the north, and the ebb to the south.

The islands San Miguel, Kakraray, and Batan.—These islands are separated from each other by channels full of rocks and shoals that dry at low water, rendering them impracticable; the north coast of San Miguel is bordered by reefs, the extent of which has not been determined, it is, therefore, prudent to give the coast a berth of at least 2 miles.

At Batan there is a coal mine being worked; and on the north side of the island a harbour in which a steamer 250 feet in length can find good anchorage, in a depth of 5 fathoms.

Rapu Rapu island is high; it is separated from Batan by a channel one mile wide, but too much obstructed by rocks to be navigable. A reef stretches about a mile out from the middle of the south shore, and dries at low water; a broad shoal projects 3 miles north-eastward from the north-east side of the island; and a rock lies one mile W.S.W. of the western point of the island.

ALBAY GULF, south of the above-named islands and 24 miles long east and west, is 6 miles wide between Rapu Rapu island and Montagan point in Sorsogon; and $4\frac{1}{2}$ miles in width between Kakraray island and Paron point. The shores are in general steep, but the indentation in the southern part, called Poliki bay, is shallow and foul.

Sulat port, formed by the southern part of the narrow channel that separates Kakraray island from the main land, is well sheltered and has good holding ground. It is 4 cables wide, and 11 fathoms deep at the mouth, continuing the same width and depth for half a mile to the northward. The channel then curves to the westward and narrows to

half a cable, so that only the lightest of coasters can enter Tabako bay by it. Both the entrance points are bordered by reefs one cable in width. This port affords a good place of refuge for a vessel in Albay gulf caught by bad weather.

Libog, at the head of Albay gulf, is a town of about 7,200 inhabitants, on the left bank of a little river. A reef lines the shore near the town, and is shown on the chart to extend to three-quarters of a mile from the shore.

Shoals.—S.E. of Libog, at a distance of 2 miles, there are two rocky shoals, each one cable in extent and covered by 3 feet water. From the northern shoal Sulat point bears N. 56° E., and Libog town N. 30° W.; the other shoal lies about half a mile south-westward. Further shoals, the particulars of which are not known, lie towards the centre of the gulf, at about 5 miles south-eastward of Libog. This locality should be approached with caution.

Albay river, about 5 miles south of Libog, is of little importance, and has a depth of one foot only on the bar at low water. The new town of Albay, capital of the province, of about 12,000 inhabitants, stands on level ground one mile W.S.W. of the old town of Albay, which was the capital before the eruption of the volcano in 1814. The new town is sheltered from the volcano by an isolated conical wooded hill with flat top, named Linguin, which, as also a low hill named Kapuntakan on the south point of the river, are good marks for making the anchorage. Between Libog and the river Albay the shore is bordered by a sand beach, having depths of 9 to 11 fathoms near it. The town of Albay exports hemp to the value of \$3,000 annually.

Albay volcano, situated on a great plain about 5 miles from the shore near Libog, is one of the most remarkable volcanoes of the Archipelago; it forms a perfect cone 8,274 feet high, always crowned by a great plume of vapour, and is a good mark for navigating the coast.

COAST.—Poliki bay is largely occupied by reefs, at the edge of which the depth is 5½ fathoms; on the western side there are several little channels which do not afford good anchorage.

Paron point, near the middle of the southern shore of Albay gulf, is high and steep: there is a thermal spring near it, the vapours from which can be seen at a great distance.

Jesus point, 3 miles south-east of Paron point, has on its western side a little beach, near which there is anchorage. From Gajo point, 2 miles south-east of Jesus point, a reef, which extends eastward nearly a mile, fringes the shore as far as the head of Sugot bay.

Sugot bay is 3 miles wide, and penetrates 3 miles to the southward ; the eastern shore is fringed by reef extending in some places to only a few yards and in others a great distance. The only good anchorage is off Nabug in a depth of 18 to 20 fathoms, but the reef here is very steep-to. The western shore is foul.

The river and town of Sugot are at the head of the bay, where there is good anchorage, to reach which keep in the middle of the bay, and when the last fish weir at the head of it is in line with the east slope of Bulusan mountain bearing South, stand in for it passing the first weir on the right at the distance of about $2\frac{1}{2}$ cables. The shoal on the port hand can be distinguished by the discoloured water, especially at low tide. After being well past it, keep a little to port and anchor in a depth of 6 or 7 fathoms, mud.

Coal.—A layer of coal, similar in quality to Australian coal, has been discovered at Gatbo, a village S.E. of Sugot town.

Montugan Bingay point.—A line of reef extending more than a mile out fringes the shore from Pagjuriran point to Montugan point, where it projects in a north-easterly direction for about $2\frac{1}{4}$ miles (with a small islet on it), and continues round the coast into San Bernardino strait. This part of the coast has never been surveyed.

SAN BERNARDINO STRAIT has been described in Chapter VIII.

Directions.—Ships steering for San Bernardino strait from the eastward generally make the bold high land of cape Espiritu Santo, the north-east extremity of Samar, which is proper with an easterly or southerly wind ; but if the wind be northerly it seems advisable to steer direct for the strait, as the north coast of Samar is with that wind, a lee shore for 60 miles before reaching the strait. From Espiritu Santo to the entrance of the strait the coast is bordered all along with islets, shoals, and reefs.

The EAST COAST of SAMAR has not been sufficiently explored for an exact description to be afforded. It is, however, known that the coast is irregular and hilly, bordered by little islets and rocks, and fringed by a narrow reef which is clean and steep-to : that there is no good port on the coast, and that the several bays which open along it offer neither good anchorage nor shelter from the winds and seas of the Pacific ocean. The charts must be used with caution.

Cape Espiritu Santo, the north-eastern extremity of Samar, lies 11 miles E.S.E. of Palapa port, and is formed of high land scarped and steep, visible in clear weather at a distance of 40 miles, serving as an excellent mark for working the strait of San Bernardino. Mount Palapa, which rises 8 miles south-west of cape Espiritu Santo, is visible at a distance of 42 miles.

PORT LIBAS, in lat. $11^{\circ} 46' N.$, is 4 cables wide at the entrance between the reefs on either side, and penetrates 2 miles to the westward, but the head of the port is filled by shoals leaving only a clear space within the entrance 7 cables wide. The depth at the entrance is 17 fathoms, shoaling to 5 fathoms at about one mile within.

Anchorage.—There is anchorage, open to the eastward, in a depth of 9 fathoms half a mile inside the entrance, and more sheltered anchorage in 4 fathoms westward of Kanaibon point on the northern side of the port.

Tides.—It is high water at port Libas, at full and change, at 6h. 10m. Springs rise $7\frac{1}{2}$ feet, neaps 3 feet.

Borongan, in latitude $11^{\circ} 41' N.$, is the only place on the coast where supplies can be obtained. The town, which numbers 9,400 inhabitants, stands at the bottom of a little bay about a mile wide and 6 cables deep with a sandy beach at the head of it. The river Burumhan discharges itself into this bay, the entrance to which is between the islands Ando and Divinubo, both moderately high. The depth of water is 37 fathoms between these islands, 26 fathoms within them, and $5\frac{1}{2}$ fathoms very close to the shore of the bay. Ando island is united by a reef to Anitaguipan point on the main coast to the northward; and there are islets and reefs between Divinubo island and the point of the coast south of Borongan. A small steep rocky shoal lies in the middle of the bay, with the south point of Ando island bearing $N. 70^{\circ} E.$

Anchorage.—During the N.E. monsoon the best anchorage is about 4 cables south-west of the middle of Ando island; during the S.W. monsoon there is good anchorage in the bay of Borongan, and also in another bay immediately to the south, in a depth of 9 fathoms at the distance of 6 cables from the shore.

The Suribao or Saru river enters the sea about $2\frac{1}{2}$ miles south of Borongan, with a wide estuary closed by a narrow bar. This river takes its rise to the south-west, not far from the sources of the Vasey river which flows into San Pedro bay.

The coast.—From Borongan to the southward the coast is less elevated than it is to the northward. There are extensive cocoanut plantations between Borongan and Lanang, chiefly utilized for the production of cocoanut oil. An extensive, but little known, bay opens between Matarinao point at the north part of the peninsula of Guiuan, and Nagas point; at Pambujan, in this bay, there is said to be a good typhoon anchorage; the southern part of the bay is foul. The peninsula of Guiuan is fringed by a reef which extends at furthest to one mile from the shore. Near the edge of the reef several sulphur springs gush forth which, though covered at high-water, are nevertheless not brackish.

See plan of port Libas, No. 1,622 [2,664], and chart, No. 2,577 [2,656].

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The SOUTH COAST of SAMAR is formed by a tongue of land of moderate height, terminated by a little island. The town of Guiuan, of 13,900 inhabitants, stands on the western shore 10 miles from the south point. The land between this point and the town is higher than the rest, and is fronted by a wide reef extending 7 miles to the west of the point, and 6 miles south-west of the town.

Between the town of Guiuan and Gigoso point, which lies 13 miles W.N.W. and has a little hill on it, there is a bay of irregular outline and full of dangers; the shores are completely hidden by mangroves and fronted by a reef, an opening in which, however, leads to an anchorage in a depth of 4 to 6 fathoms opposite the town of Guiuan.

Manikani island, $4\frac{1}{2}$ miles W.S.W. of Guiuan, is nearly circular, 2 miles in diameter, with a central hill of moderate height. It is surrounded by a reef which reaches 5 miles to the north-west, with a width of $2\frac{1}{2}$ miles, and having on its end the islets Baul and Binabasalan. Between the island and reef of Manikani and the main coast reef, there is a deep channel running 8 miles south-east and north-west. This channel is 2 miles wide and has a depth of 11 to 20 fathoms; there are several small islets in it. Vessels of all sizes can find anchorage in the channel.

The southern entrance to this channel, between a 2-fathoms coral patch lying S.E., 6 cables from the eastern point of Manikani island and the western edge of the reef off the south point of Samar, is nearly a mile wide and has a depth of 15 fathoms in the middle. At 7 cables north-east of Manikani there is a rock which dries at low water, and which can be passed on either side, but the best course to follow is to leave this dry rock and the islets Kambasingan and Kabalarian to the south-west, and Kaninoan islet to the north-east.

The northern entrance, between the islet Balinatio on the shore of the bay (with a *vantay* on its southern end), and the islets Baul and Binabasalan on the end of the Manikani reef, is two-thirds of a mile wide with a depth of 17 fathoms. A shoal of $1\frac{1}{2}$ fathoms lies in mid-channel between Binabasalan and Balinatio islands, and a 2-fathoms patch N. 22° E. 5 cables from Binabasalan. In the approach from the south-west there is a reef, about one mile in extent N.W. and S.E., with patches of 3 feet and a general depth of 2 fathoms, which lies S. by E. $\frac{3}{8}$ E., $4\frac{1}{10}$ miles from Gigoso point.

Anchorage may be found in the opening of the reef leading to the town of Guiuan, with the church bearing N.E., care being taken to avoid the edges of the reef on both sides, as well as a small shoal patch in mid-channel, and a large shoal near the anchorage. The depth of water at the entrance of this opening is 14 fathoms, lessening gradually to 6 and 4 fathoms off a sand beach bordered with rocks in front of the town. There is also anchorage N.E. of the islet Kabalarian in a depth of 13 fathoms.

The coast.—From Gigoso point the coast trends westward for 16 miles as far as Capines point, and forms between these points two clean bays with deep water in them, separated by Kablagna point. The villages along this coast offer few resources, and neither wood nor water can be procured.

Shoals.—There is an extensive coral patch half a mile westward of Kablagna point. A rocky shoal is marked on the chart one mile south of Kablagna point; this is probably the coral reef upon which H.M.S. *Sphinx* struck in 1861, as from the reef Capines point bore N. 87° W. It is 4 cables long north-west and south-east, about 1½ cables wide, and is covered by one fathom water. Another rocky shoal named Kalianan lies in the entrance of the bay between Kablagna and Capines points, eastward 5 miles from the latter. The chart of this part of the coast is reported to be incorrect.

Capines point is moderately high and wooded. Alabat point, at the entrance of San Pedro bay, lies 2 miles N.W. by W. of Capines.

The East coast of Leite island and Surigao strait, with the N.E. coast of Mindanao to Kaut point, are described in Chapter VII.

EAST COAST OF MINDANAO runs nearly north and south for a length of 195 miles from Kaut point to cape San Agustin, and forms several bays open to the N.E. A great chain of mountains runs parallel to the coast and near to it. The coast is imperfectly known, and too great reliance must not be placed on the charts.

Kaut point is a spur of the eastern cordillera of Mindanao; when seen from the northward it appears bluff, but viewed from the south-eastward it makes like two islands. It is clean and steep to the northward and westward, but a reef projects north-eastward from it to the distance of fully 5 miles; a reef about one mile in width also borders the coast to the southward for a distance of 10 miles.

Tandag point, shown on the chart as lying 14 miles S. ½ W. from Kaut point, is bordered by reef to the distance of 2 cables. Two islets lie close northward of the point. Makangani island, 4 miles N.E. by N. of Tandag point, is clean; two rocky islets lie off its northern end.

Arangasa island.—From Tandag island the coast trends S.E. by S. for 19 miles as far as Umanum point. North of this point is the island Arangasa, separated from the main coast by a narrow channel closed by reefs, which extend 4 miles out, east and south-east of the island.

Liangan bay.—From Umanum point, southward, the coast is foul for 10 miles nearly to Jobo point, the reef projecting 2 miles out and enclosing the islet Ayninan. Liangan bay is formed between Jobo and Bankulin points, Liangan town being at the bottom of the bay. The chart shows a shoal in the fairway leading to the town, but gives no soundings. Jobo islet lies off the northern point.

Mr. Leney, Lloyd's agent at Iloilo in 1878, says of Liangan bay: "The best anchorage is off the convent in a depth of 15 fathoms. A heavy anchor should be used, as the land winds are strong. The river marked on the chart as flowing at the head of Liangan bay, is only a shallow creek. The coast here is rocky, and landing after dark is difficult. Supplies of fresh water, buffaloes, and rice can be had, but no vegetables."

The coast, which trends south for 15 miles from Bankulin point to Bislig bay, is very foul, and bordered by dangerous sand banks, which uncover at low-water. The town of Hinatuan is situated on the right bank of a river about 12 miles south of Bankulin point, fronted by Tigdos islet, which is surrounded by a reef. Supplies of buffaloes and rice can be obtained at Hinatuan, but very little fresh water.

Bislig bay and town.—Masahuron island, in the middle of the entrance to the bay, is surrounded by shoals which extend half a mile east and west of the island. In the passage south of the islet there are two rocky shoals very steep-to, having a depth of 47 fathoms quite near them. The southern shore of Bislig bay is clean; the northern shore, on the contrary, is foul, and should not be approached within 6 cables.

Bislig town, with a population of 4,300, is at the bottom of the bay on the right bank of a river; the bar at the mouth of this river has a depth of 8 feet upon it at high water.

The anchorage before the town, in a depth of $3\frac{1}{2}$ fathoms, sand and mud, is completely sheltered from all winds. Fresh water, buffaloes, and rice can be obtained at Bislig, but no vegetables.

Caution.—If without a pilot in approaching the coast of Bislig bay, do not come into a depth of less than 6 fathoms, as the water shoals rapidly. The channel for boats and lorchas is generally marked by bushes or stakes.

The coast.—A reef extends 3 miles out eastward and 6 miles south-eastward from Sanko point, the southern point of Bislig bay. The coast, from this point for 10 miles to the southward as far as Tambog point, is bordered by reefs. South of Tambog point, between that point and Katarman point, there is a great reef which forms with the main coast a small but safe port; the narrow channel leading to it should not be taken without a pilot.

South of Katarman point there is a great bank which dries; at the edge of this bank there is a depth of $3\frac{1}{2}$ fathoms, and southward of it there are two islets surrounded by rocks. A shoal of sand projects half a mile north-west from Tonkil point. From the Katel river, south of Tonkil point, the coast trends south for a distance of 12 miles, as far as Kinablagan point, and is clean.

Kinablagan point is high and wooded; when seen at a distance it appears like an island. The river and town of the same name lie on the south side of the point. There is anchorage off Kinablagan near the shore in a depth of 8 fathoms, but it scarcely merits the name of an anchorage being quite open and exposed. The river can be entered by boats only.

Baganga bay, between Lambajon and Daguet points, offers good anchorage during the S.W. monsoon, in a depth of 5 fathoms, a reef which projects from Daguet point giving shelter from the east and south-east; but during the N.E. monsoon the anchorage is quite untenable on account of the heavy sea which sets in. Daguet point is detached from the coast, and consists of white sand covered by low wood. A shoal of $4\frac{1}{2}$ fathoms lies off it.

From Daguet point the coast trends south for 15 miles as far as Karaga bay, and presents low points and some small rivers. A few villages of slight importance stand on the shore.

Karaga bay, between points Sankol and Pusan, is semi-circular in form, open to the eastward, and penetrates about 2 miles inland. The village of Sankol stands on the shore near the point, close to a cocoanut plantation. There is anchorage in a depth of $4\frac{1}{2}$ fathoms W.N.W. of Pusan point, off some rocks at the commencement of a beach, but it is exposed to the swell; there is also anchorage off Tubu on the south side, sheltered from southerly winds; it is the only place on the south coast where there is a sand beach. Sankol point is low; a rocky shoal covered by $1\frac{1}{2}$ fathoms water projects a mile out from it.

Pusan point is low, and formed of cavernous rocks; it is clean, and may be rounded at the distance of a cable. The current begins to be strongly felt off this point, and at spring tides violent eddies are produced, raising a high sea.

Bunga point, 9 miles south of Pusan, is the first point which is not mountainous met on coming northward from cape San Agustin. There is a bay south of the point, on the shore of which stands the village of Manay, with a little fort surrounded by *cogonals* of a red colour.

Buan point, 6 miles southward of Bunga point, is sandy, with a narrow reef off it, and may be recognised by a *cogonal* on it. A small stream, which can be entered by boats only, passes through the cogonal. Fresh water can be obtained from it.

Maglubun point, $3\frac{1}{2}$ miles S. by W. of the last point, is clean and projecting, and easy to recognise. Several villages stand on this part of the coast, which is clean and wooded, but beaten by the sea. The village and fort of Mamponon are near a small river, but there is too much sea on the coast for anchorage.

Mayo bay, between Tugubun point 9 miles south of Maglubun and Lamigan point, is a large bay over 5 miles wide at the entrance between these two points, and penetrating 5 miles to the westward; it is but little known. Tugubun point is hilly and wooded; a shoal of sand-rock projects one cable from it. Yukatan anchorage is on the north shore, 2 miles west of Tugubun point. Points Flaca and Gorda, west of Yukatan, are formed by hills which terminate in low points; a reef extends some distance out from Gorda point.

PUJADA BAY, separated from Mayo bay by the long peninsula of Guanguan, which terminates in Lamigan point, would be the best in Mindanao were it not for the very great depth of water in it. The bay penetrates some 12 miles from the entrance, and has an extreme width of about 6 miles at the middle of it.

Lamigan point, the north-eastern point of the bay, is said to be clean to seaward, but fringed westward by reef as far as Taganilao point.

Pujada island, 558 feet high, divides the entrance into two channels; of these, the south-western, nearly $1\frac{1}{4}$ miles in width, appears to be clear. A reef, two-thirds of a mile wide, extends $2\frac{1}{2}$ miles in an E. by S. direction from the south side of Pujada island, and near its end is a flat-topped rock; the sea breaks on this reef even at high water.

The north-eastern channel lies between Pujada island and the shore reef of Guanguan peninsula, and further in between the north end of Pujada and a reef extending about 4 cables southward from Uauivan islet lying off the eastern shore of the bay; this channel also appears to be clear.

Mati is a small and unimportant town, standing in a wide prairie land, surrounded by picturesque scenery; the shore near it is steep-to, and there is anchorage off the town, near the shore, in a depth of 10 to 17 fathoms, with the pier head bearing N. by W., distant about $1\frac{1}{2}$ cables. Good water is obtainable but provisions are scarce. Steamers from Samboanga and Pollok trade to Mati.

Lights.—From poles on the mole head at Mati, *two fixed red* harbour lights are exhibited, at an elevation of 26 feet above high water, visible in clear weather at a distance of 4 miles; these lights show *white* landwards.

The lights are maintained by local merchants, and are not to be depended on.

The coast on the east side of Pujada bay is foul from Mati to Likok point, a distance of 5 miles; northward of Likok point, a broad rocky flat covered only by $1\frac{1}{2}$ feet water extends out for a mile; a small rocky patch with the same depth is found at this distance from the shore midway between the flat and Mati town. About 4 miles S.E. by E. from Mati, a creek at the back of the rocky flat leads up to a narrow isthmus separating the

bays of Pujada and Mayo. The natives haul their canoes across this neck of land and launch them in Mayo bay.

There is an indentation 2 miles deep on the west side of the bay about 5 miles from Mati, called Balcte; the water in the outer part of it is too deep for anchorage, and the upper end is largely occupied by the broad shore reef which encircles it.

The shores of the bay abound in good timber, such as *Alintato*, an ebony; *Molavi*, a teak; *Camunu*, *connarus santaloides*, useful as a cabinet-makers' wood; and cedar. Cacao, coffee, and tapioca are cultivated; mastic of good quality, wax and honey are plentiful; deer and mountain hog abound.

Makambol point, on the west side of Pujada bay, has a reef projecting eastward from it about $2\frac{1}{2}$ cables, to the southward of which there is anchorage in a depth of 8 fathoms near the shore. There are plantations of cocoanut and plantains on this part of the coast.

Off Magun, within Tumadgo point, there is indifferent anchorage.

Tumadgo point, the southern point of Pujada bay, and also Alo point, a little to the southward, are peaked and clean.

Tides.—In Pujada bay it is high-water, full and change, at 6h.; springs rise 6 feet.

COAST.—**Luban point**, 15 miles southward of Alo point, off which there is a small round islet, is clean and bold; in a small bay, to the northward of the point, vessels can find shelter in a depth of $5\frac{1}{2}$ fathoms during the S.W. monsoon, while waiting for favourable weather to round cape San Agustin. The coast between Luban point and Pujada bay is clean, and presents several scarped points with patches of red *cogonal* on them. The coast between Luban point and cape San Agustin is high and clean, with little points of sand and rock.

CURRENTS on the EAST COAST of MINDANAO.—

A constant current to the south has been observed on this coast, especially at a distance beyond 4 miles from the shore; within this distance the tides preserve their influence in some places, but near the projecting points the current remains constant. To the northward of Mayo bay, this current shows itself in strong races which increase in force on approaching Pusan point, where they attain their greatest strength. They are very violent off Daguet point, and also off points Lambajon and Kinablagan. In order to lessen the effect of the current, a vessel should keep at a good distance from the shore. Near the coast the sea is always very rough and choppy, and vessels suffer a good deal from it.

See chart, No. 2,575 [2,626].

CHAPTER X.

CELEBES SEA, BASILAN STRAIT TO MOLUCCA PASSAGE.

 VARIATION $1^{\circ} 20'$ East in 1902.

SOUTH COAST of MINDANAO.—Sibuguey bay.—

From the north-east entrance of the Sakol channel the coast of Mindanao trends N.N.E. for 53 miles, and then, after curving round to the eastward for about 10 miles, runs southward for 30 miles, and forms the extensive bay of Sibuguey, terminated to the south-east by Olutanga island. The coasts of this bay are bordered by islands and reefs, and have not yet been properly surveyed; navigation in it should therefore be conducted with caution.

Panubigan islands consist of fifteen small islands, and several little islets situated near the coast of Mindanao, about 7 miles northward of Sakol island. They are wooded, and, for the most part, clean and steep-to. The northernmost of the group, Palmabrava, is surrounded by a reef which projects a quarter of a mile, and almost joins the coast. Between this island and the reef off Koroan point, there is a small anchorage with a depth of 7 fathoms. There is also anchorage in 5 fathoms in the two little bays south of the Panubigan islands.

Coast.—From the Panubigan islands the coast trends N.N.E. for about 14 miles to Vitali point, which is fronted by four islets, clean and steep-to, and several rocks which extend out 3 miles from the point, they are named the Tigbaou islands.

Port Banga, situated 6 miles northward of the Tigbaou islands, is safe and well sheltered, but its entrance is not readily distinguished; it is $2\frac{1}{2}$ miles long north-east and south-west, with a maximum width of one mile. An islet, with a reef extending 3 cables to the south, divides the entrance into two deep passages, $1\frac{1}{2}$ cables in width. On the eastern side of the port a reef extends towards the small island off the western shore, but leaves a clear deep passage between. The anchorage is about midway between this reef and the western shore, in a depth of 16 to 18 fathoms. The reef off the east point of entrance extends $1\frac{1}{2}$ miles to the eastward, and $2\frac{1}{4}$ cables to the south-west.

The coast then trends N.N.E. $\frac{1}{2}$ E. for 21 miles, forming several bays edged by islets and reefs, with depths of 14 to 36 fathoms at 2 miles

 See charts, Nos. 2,576 [2,605] and 2,578 [2,648].

from the shore, as far as 2 miles north of Buluan island, which is high, conspicuous, and surrounded by rocks; there is anchorage about one mile north of Buluan in a depth of $6\frac{1}{2}$ fathoms. From this position a line of soundings of from 12 to 22 fathoms has been obtained across the head of Sibuguey bay to Kabut island; northward of this line the depths decrease gradually to the head of the bay.

The village of Marasingan, near which layers of coal have been found, lies 4 miles inland to the S.E. of Kabut island.

The east coast of Sibuguey bay, from Kabut island to the narrow channel separating Olutanga from the mainland, is bordered by a rocky shelf, which for 9 miles southward of Kabut island, opposite mount Sibuguey, extends out one to 2 miles from the shore. Detached reefs are reported to extend to the distance of 5 miles off this part of the coast.

Pandalusan island, 5 miles off the coast, is of moderate height and surrounded by a narrow sand-beach, steep-to; a V-shaped reef projects $1\frac{1}{2}$ miles from the island in an E.S.E. and S.E. direction. A rocky shoal, awash, one mile in extent, lies $4\frac{1}{2}$ miles N. by E. of Pandalusan, and at 4 miles E.N.E. of this shoal there are two smaller shoals, near the coast. Between Pandalusan and the first shoal, and between these and the other two shoals there are depths of 11 fathoms.

At the distance of $4\frac{1}{2}$ miles, S.S.E. from Pandalusan island, there is a shoal 3 miles long and $1\frac{1}{2}$ miles wide, forming part of the shore dangers extending from Olutanga island; another shoal lies west of the above with Pandalusan island bearing N. $\frac{1}{4}$ E., distant $4\frac{1}{2}$ miles.

Danger line.—The chart indicates by a dotted line the supposed limit of dangers extending 5 miles westward from Olutanga island, and fringing it about $2\frac{1}{2}$ miles southward and eastward; other shoals and reefs may exist, and the edge of the approximate limit should not be approached.

Circe bank, consisting of sand and coral, with a depth of 3 fathoms over it, is one mile long N.N.W. and S.S.E. and half a mile wide. It lies with Pandalusan island bearing N. 2° W., distant 11 miles, and the south point of Olutanga island S. 83° E. Another shoal is stated to exist about 3 miles N. 67° W. from Circe bank.

OLUTANGA ISLAND is very low, covered by mangroves, and surrounded by reefs. The narrow tortuous channel separating it from the mainland is only practicable for small craft; it is occupied by a fishing population who live entirely in their boats; the island of Olutanga is not inhabited.

Arayat shoal, extending one mile east and west, and half a mile broad, with a depth of $3\frac{1}{2}$ fathoms, lies situated with Lutangan point bearing N. 89° W., distant $8\frac{1}{2}$ miles, and Taguisian point N. 6° W. A chain of shoals extend from here to Dumankila point.

Tantanang bay.—The entrance to this bay is open to the south-east, and is 2 miles wide between the reefs that project from the coast of Olutanga, and from the north point of entrance; and there is a depth of 6 to 8 fathoms between the islands Letayen and Sibulan. In the middle of the mouth of the bay there are two shoals covered respectively by $3\frac{1}{2}$ and $2\frac{1}{2}$ fathoms. In the centre of the bay there are some shoals of white sand, awash at low water; between them and the western shore the bay is well sheltered, and has a depth of 13 fathoms, decreasing gradually to the northward and westward; a river enters on the western side.

There is good anchorage in a depth of 5 fathoms, hard bottom, on the north-east side of Olutanga, in the bight south-eastward of Kambulung point.

Tumalung bay, on the north side of Olutanga, has a moderate depth of water, and is well sheltered in all weathers. There is anchorage in 9 fathoms west of Simangul point, the northern extremity of Olutanga; the depth decreases gradually southward and westward. An islet, fringed northward by a reef of 4 cables extent, lies near this point and a little to the N.N.E. of the point there is a bank of sand.

DUMANKILAS BAY affords good shelter and holding ground among the islands and bays that it encloses; the general depth is 8 to 16 fathoms, with 5 fathoms near the shore. The coast of Lapirauan island is foul, but on the edge of the reef that borders it, which shows under favourable conditions, there is a depth of 8 fathoms. Lapat point is foul for practically 2 miles in every direction.

Acha rock, a small circular patch of sand and coral, steep-to, and covered by $2\frac{3}{4}$ fathoms, least water, lies in the entrance of the bay, $6\frac{1}{2}$ miles west of Dumankilas point.

The islands **Muda**, **Dakula**, and **Paya**, on the west side of the bay, are clean and steep-to, with channels of 9 fathoms depth between them. To the west of Paya, the northern island, there is a rock. Piratas rock lies one mile east of Dakula, the middle island; it is steep-to and uncovers at very low tides.

Cherif islands are three small islands, clean and steep-to, dividing the channel into two passages. A shoal, one cable long N.N.E. and S.S.W., lies 6 cables N.N.W. $\frac{1}{2}$ W. of the largest Cherif island.

Dayana island is also clean; to the W.N.W. of it lie the point and village of Silupa, with anchorage south of the point in a depth of 4 fathoms near the shore; to the southward the coast is bordered by reefs and shoals. The head of the bay, northward of Silupa point, is occupied by a great bank.

Danger.—A shoal,* covered by $1\frac{1}{2}$ fathoms lies between Dayana island and Igat point; from it the western Cherif island is in line with the highest part of Dakula; and Putili island on with the second hill of Dayana point.

Fatimo islands are clean and steep-to on the south side; but on the north side, the bank which fills the head of the bay nearly dries at low-water. The entrance to Kumalarang creek, practicable for light craft at high-water, lies N. by E. of Fatimo islands.

Igat bay, to the north of Igat island, is well sheltered and safe. The shores of the bay are clean and steep-to, except to the north-east, where there is a shoal which projects south-westward $1\frac{1}{2}$ miles. The river Dumankilas enters here by several mouths: the locality is unhealthy. Putili islet, in the middle of the entrance is steep-to. Igat island is separated from the mainland by a narrow channel, near the eastern part of which there is a good watering place. Off the western end of Igat island, there is a narrow reef.

Danger.—In the middle of the bay, south of Igat island, there is a shoal of white sand which uncovers at low water springs.

Coast.—From Karabuka point to Dumankilas point, the coast is clean and steep-to, except north of Triton island, which is a large rock surrounded by a narrow reef.

Marigo Satubig on the eastern side of Dumankilas bay is a land-locked harbour and one of the best in Mindanao. There is an old Spanish fort here in which a native chief resides.

MALIGAY BAY, is bordered on the eastern side by a reef over which there is from $1\frac{1}{2}$ to $3\frac{1}{2}$ fathoms water, which reduces its available space by one half; in the navigable part the depth is from 27 to 37 fathoms, and it is deep close to the edge of the reef. The village of Banganga is situated in this bay.

Flecha peninsula is traversed throughout its length by a range of hills, the highest of which, Alto de Flecha, can be seen at a distance of 24 miles in clear weather. The west coast of the peninsula is clean and steep-to; the east coast from Flecha point, its southern extremity, to Tambatan point is clear.

Panikian island is low; a shoal, covered by 7 fathoms, extends one mile S.S.E. of the island, and is very steep on its eastern side, no bottom having been obtained at a depth of 84 fathoms close to it. The channel between the island and the coast is safe.

Anchorage.—During the N.E. monsoon vessels can anchor in the middle of the bay south of Alto de Flecha in a depth of $5\frac{1}{2}$ to 9 fathoms; water may be had at a rivulet about $1\frac{1}{2}$ miles east of the anchorage. There is also anchorage in the same depth off Flecha point, but when the monsoon blows fresh, a heavy sea sets round the point.

* Not shown on the chart, the points given not being identifiable.

See chart, No. 2,578 [2,648].

ILLANA BAY is comprised between Flecha point and Tapan point, distant 40 miles. It is separated from Iligan bay on the north side of Mindanao by an isthmus 13 miles in width.

Rios rock, situated in the approach to the little port of Dinas, is a circular rock half a mile in diameter; from its centre mount Bakayauan bears W. $\frac{1}{2}$ N., distant $4\frac{1}{2}$ miles. Takut Parido, a rock smaller than Rios rock, is said to exist outside it.

Port Dinas is of little importance; it is formed by an opening in the reef that borders the coast south of Pisan point. This reef continues past the Tikala islands, extending $1\frac{1}{2}$ to 3 miles from the shore; between the Tikala islands and Dupulisan point the coast is clean at the distance of one mile, the reefs extending out from half a cable to 6 cables. The entrance to port Pisan is only 2 cables wide, and it should not be entered without a pilot except at low-water with the sun and weather favourable for seeing the reefs. There is a depth of 11 to 13 fathoms in the passage, and the anchorage is in $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms near the shore. The direction of the passage is with mount Sambuluan bearing N. 50° W.

The town of Pisan lies a little north of the anchorage, 2 miles from the mouth of the river of the same name. The country is marshy and unhealthy; during the rainy season the water rises to 5 feet above the surface of the soil.

There is also anchorage in a corner of the reef west of Sagarayan, one of the Tikala islands, in a depth of 9 fathoms.

Shoals in the outer approach to Pagadian bay:—

A shoal one cable in extent, with a least depth of 6 feet over sand and rock, lies with Kalibon point bearing N. 13° E. distant 8 miles, and Semaruga point N. 77° E.

A coral shoal, upon which a least depth of 16 feet has been found, 4 cables long north-east and south-west and 3 cables wide, lies with Dupulisan point bearing N. 51° W. distant about $4\frac{1}{2}$ miles, and Sagarayan island S. 30° W.

Pagadian bay, in the north-west part of Illana bay, includes the anchorages of Dupulisan and Tiguma. Immediately before the entrance there are some coral banks, the westernmost one of which is awash, with passages between them and the shore to the northward and southward. The southern passage is preferable, being wider and more direct. There are also two other shoals in the bay, the outermost of which lies about three-quarters of a mile north from Dupulisan point, situated in a line between that point and the small island $1\frac{1}{4}$ miles northward of it; the inner of these shoals is at the edge of the reef, one-quarter of a mile westward from the outer shoal.

Dupulisan point is bordered by a reef to the distance of 3 cables. There is anchorage westward of the point in a depth of about 9 fathoms, sheltered from south and south-east winds.

Tiguma point is fronted by a reef which continues along the coast to Tukuran, and extends from half a mile to $1\frac{1}{2}$ miles from the shore. The anchorage is near the coast in a depth of $3\frac{1}{2}$ fathoms.

Coast.—From Tiguma, as far as Pollok harbour, the coast is bordered in many places by reef which extends one or two miles from the shore, particularly from about 2 miles north-westward of Dugolaan point to Semaruga point; reef also extends one mile south-west from Sigayan point, and 2 cables from the shore between Lapitan point and Baras. This coast affords anchorage in Sigayan bay, in the small bight half a mile eastward of Magapu point, and elsewhere in other small bays, generally very near the shore. Several rivers and lagoons open into the bay, on the shores of which there are many villages. The native inhabitants, with the exception of those of Tiguma, are in general hostile to strangers, and it is prudent to take precautions whilst dealing with them, without doing so ostensibly.

Pinatayan bank consists of two reefs, parallel to each other, extending 4 cables in a S.S.E. and N.N.W. direction; it is one cable wide, with a least depth of $1\frac{3}{4}$ fathoms. From the eastern part of the bank the north point of Bongo island bears S. $\frac{1}{2}$ W., and Matimus point E. by S. $\frac{1}{4}$ S.

A shoal, with a depth of about 2 fathoms over it, lies north-eastward of Pinatayan bank, at from about one to $1\frac{1}{2}$ miles from the coast, approximately situated with Matimus point bearing S.S.E. $\frac{1}{4}$ E., distant 2 miles.

POLLOK (PALAK) HARBOUR, between Panga point to the north, and Marigabato (Red rock) point to the south 4 miles distant, is an excellent harbour, but open to the westward; it is, however, protected from the winds of that quarter by Bongo island before the entrance. The harbour is of good depth and safe. On the north side it contains the bays of Kidamak and Sugut, and on the south side a wider bay in which are the anchorages of Pollok and Parang Parang.

A steep coral reef fringes the coast; on the north side it is very close to the shore; on the south side it extends to 2 or 3 cables from it; and south of Sugut bay it projects about $1\frac{1}{2}$ miles to the S.W. The depth at the entrance is over 40 fathoms; within, it ranges from 15 to 25 fathoms; and alongside the fringing reef is about $5\frac{1}{2}$ fathoms. The entrance presents no difficulties: a small detached hill at the bottom of Parang bay serves as a good mark.

Pollok town, deriving its name from the Moro word *palak*, separated, is situated on the island Pollok, which forms the southern point of the bay and is separated from the mainland by a narrow channel, Sampinitan

See plan of Pollok harbour, No. 957 [2,646].

with a depth of only $1\frac{1}{2}$ feet in it at low water. The mole at the north end of the town has a depth of 14 feet at its outer extremity. The town contains a population of 520 inhabitants.

Lights.—From the mole head at Pollok a *fixed red* light is exhibited, visible in clear weather at a distance of 3 miles. At Parang Parang a *fixed green* light is shown.

Anchorage.—Large vessels should anchor S.E. of the beacon at the end of the reef, which projects eastward of the mole, in a depth of 16 fathoms. Small craft can anchor at the entrance of Sampinitan creek in 9 fathoms; in that position they should moor in order to keep a clear anchor. The reef near the settlement is marked by beacons, and the southern limit of anchorage by a spar buoy. The mooring buoys here are not kept in order, and their position is not to be depended on.

Parang Parang river can be entered by boats with difficulty; the water in it is good and abundant; a Moro town is on the north bank.

Sugut bay is half filled by a reef; a village lies on the west coast.

Kidamak bay contains a small native population; the eastern point has a small reef off it; there is anchorage on the eastern side of the bay in a depth of 8 fathoms.

Winds.—In Pollok harbour during the first months of the year, when the wind is well established from the N.E., there are often squalls in the afternoon from the north, accompanied with much lightning, wind, and rain: before the squalls begin the wind blows from north-west and west, and after they are over the land breeze sets in, and lasts until 9 o'clock in the morning. During the S.W. monsoon the wind freshens after mid-day, and varies from S.W. to West, and N.W.; rain falls in abundance, and heavy thunderstorms occur.

Tides.—It is high water full and change, at Pollok, at 6h. 5m.; springs rise 8 feet, neaps $4\frac{1}{2}$ feet.

There are always two tides in the day, with rare exceptions, which take place in the quarters of the equinoxes when the moon is at her greatest declination.

Tidal streams.—The stream turns at high and low water at Pollok harbour, and at all the ports on the coast between Samboanga and Pollok. On the coast, with the rising tide, the stream sets to the north, north-west, and west, according to local configuration. At Pollok harbour, with the rising tide, the stream sets to the east on the north shore, and follows the bend of the coast to the southward and westward; the ebb stream sets in the reverse direction.

Bongo island, off the entrance of Pollok harbour, is about 5 miles long N.N.E. and S.S.W. and $1\frac{1}{2}$ miles wide; it is some 300 feet high, and thickly wooded. The island is surrounded by a reef, which projects

as much as 2 miles W.N.W. of the north point of the island, while, on the eastern side, the reef is narrow and very steep-to; there is no good anchorage off the island. The channel between Bongo island and Panga point is 3 miles in width, with a depth of 30 fathoms.

A rocky shoal, over which is a depth of $3\frac{1}{2}$ fathoms, with 6 fathoms around, lies with the north-east extreme of Bongo island bearing S.E. $\frac{1}{2}$ S. distant about $2\frac{1}{2}$ miles, and Panga point E. $\frac{1}{4}$ S.

Volcanoes.—The cordillera of Sugut (Bangaya) lies about 23 miles eastward of Pollok harbour; the highest mountain of the range is the volcano of Makaturin the latest eruption of which occurred in 1872. This eruption was followed by an earthquake which partly destroyed Pollok, Kota Bato, and the villages on the banks of the river Mindanao.

MINDANAO RIVER.—This great river disembogues 5 miles southward of Pollok harbour by two wide arms, on the northernmost of which is the town of Kota Bato, about $5\frac{1}{2}$ miles from the mouth. The river is navigable for 60 miles by vessels of $3\frac{1}{2}$ feet draught; it flows through a beautiful valley 30 miles in width, which scarcely shows any change of level. The valley is capable of producing tobacco, cacao, sugar, maize, and cotton; but this is only known at present by specimens produced. The course of the river lies S.E. for 45 miles from its mouth to the lake Liguasan, out of which it seems to flow; from the other side of the lake the direction of the river is N.N.E. to its source in the Sugut mountains. At 21 miles from the northern mouth the river divides into two arms which enter the sea $4\frac{1}{2}$ miles apart, and between them form a great delta. These branches communicate with each other by four small channels. The northern arm is the widest, deepest, and most navigable; the southern branch is narrow, and has only 5 feet of water. The river banks are peopled by Moros.

Entrance. — Panalisan point, the northern point of entrance, is surrounded by a shoal extending half a mile to the westward. The entrance channel, which is south of this shoal, is 16 feet deep, and very narrow. Off the south entrance point a sand spit extends 2 cables to the north-west, and is steep-to. The bar, which is in front of Paiuan village, has 5 feet over it at low water. After passing the village the depth increases, and 16 to 20 feet can be carried as far up as Kota Bato.

Anchorage may be had in a depth of $3\frac{1}{2}$ to 5 fathoms northward of the northern mouth, with mount Kabalata and Timako hill in line S. by W. $\frac{3}{4}$ W., and the southern end of Bongo island bearing W. $\frac{1}{2}$ N.; the water shoals very suddenly, and the anchorage must be approached with great caution, even by vessels of moderate size.

A bank, covered by $2\frac{3}{4}$ fathoms, with depths of 9 to 16 fathoms near its outer edge, extends south-west from the southern entrance to a distance of

1½ miles from the coast, and joins the shore again near the wooded hill of Timako.

The southern entrance of the river is divided into two arms by an islet which cannot be passed on the south side; the northern arm has only 5 feet of water in it; at 3 cables to the west of this entrance the depth is 14 fathoms.

Beacons.—A red beacon or buoy marks the extremity of the north sand-bank of the entrance; a white beacon or buoy marks the extremity of the south sand-bank of the entrance.

A white and red beacon or buoy marks the head of the shoal between the islets.

A great tripod surmounted by a white cage stands on Bulusan point, and serves to distinguish the mouth of the river from other entrances on the coast.

Kota Bato town (Stone-fort) is the capital of the island, and was the residence of the Spanish Governor-General of Mindanao; it is connected with Pollok harbour by a causeway of stone. The river is 16 feet deep off the town, and vessels can anchor in it, taking precautions to avoid the snags carried down by the current. Steamers call fortnightly.

Coast-marks.—Timako island, between the two mouths of the river, is wooded to the water's edge. The hill upon it, mount Timako, is a good mark for making the river. An elevated range of volcanic mountains, dominated by the central peak Dikalingan, extends some 70 miles to the southward, and for the greater part of this distance lies nearly parallel to the coast line. The peak Kabalata, on which is a *cogonal*, 3¼ miles from the southern entrance of the river, is higher than the neighbouring hills, and is another good mark for the river.

Shoal.—A shoal, composed of coral and sand, 3 cables in extent, and with a depth of 4 fathoms over it, lies in the approach to the Mindanao river, and is situated approximately in lat. 7° 10' N., long. 124° 3' E. There is a deep water channel between this reef and the coast.

COAST.—From the south entrance of the river Mindanao the coast trends about south-west for 26 miles to Kidipil point, the most salient point of this part, and is clean and steep-to. Tapan point, situated between, is low and surrounded by a reef reaching out 3 cables. From Kidipil to Tinaka point, the southern extremity of Mindanao, the coast is generally clean and steep-to with good depths off it, and includes several little bays: it, however, has not been surveyed, and should therefore be approached with caution.

That part of the coast lying between the Mindanao river and Tuna bay is reported to be several miles further eastward than charted.

Linao bay is $1\frac{1}{2}$ miles wide, and sheltered from all winds but those from the south-west. Its shores are bordered by a narrow steep-reef. The anchorage here is in a depth of from 7 to 12 fathoms.

Huidobro reef, called Linao shoal by the Moros, is placed on the chart 3 miles W.S.W. of Linao point; it is said to be covered by a depth of $5\frac{1}{2}$ fathoms.

Port Lebak, between points Lebak and Nara, is easy of access and offers good shelter in all weathers, but a sea sets in with westerly winds, at its north-east corner is a native village. The shores are covered by mangroves and bordered by a reef which extends to about one cable from them. The best anchorage is in a depth of 11 to 13 fathoms eastward of the islet and reef Tubotubo in the southern part of the bay. Water can be obtained in the river Lebak, east of the anchorage, and also from the other rivers in the port. The natives are said to be in the habit of using poisoned arrows on the smallest pretext, it is therefore well to be careful, and not to trust them too far.

Basiauang bay presents two anchorages; that on the northward side of the bay, east of Basiauang point, affords good shelter in all weathers, but it is necessary to secure to the shore, as there is not sufficient room for a vessel to swing. The southern anchorage is at the mouth of a small creek on the northern side of a remarkable hill, connected with the mainland only by a low mangrove covered neck. The anchor can be dropped in a depth of 10 to 13 fathoms, and the stern secured to the reef. The reef at the point, and the neighbouring island of Donauang, break the sea; these anchorages of Basiauang, after port Lebak, afford the best shelter on this coast in all weathers.

The island Donauang has a reef which reaches 2 cables out to the N.N.W. The passage between Donauang and the coast is safe; a vessel should keep nearer to the island reef than that off the coast, which is more extensive.

Donauang shoals are two shoals situated respectively 3 miles N. 9° W. and 2 miles N. 3° W. from the north point of Donauang island; they are each about half a mile across and covered by $3\frac{3}{4}$ fathoms least water.

Tuna bay is semicircular, steep-sided, and bordered by a reef like all the bays of this coast. There is anchorage in a depth of 15 fathoms in the north-west part, before coming to a point covered with mangroves from which a reef projects; a small anchor should be laid out on the reef, and it is well to do this in all these bays with steep sides.

Kanipan bank, a reef which uncovers in places, and has a depth of 5 fathoms in other parts, lies 2 miles off the coast, and 5 miles S.E. of Malatuna point. Vessels should not approach this part of the coast within a distance of 6 miles.

See plans of port Lebak and Basiauang, on No. 957 [2,646].

Coast.—Pola point, 18 miles S.E. of Malatuna point, is low with a sand beach and small reef. Off it is a small sandbank, above water, about one mile from the point. At 5 miles eastward of Pola point lie the river and village of Kraan, near which layers of coal have been found. Three miles east of the mouth of Kraan river, there is anchorage in a depth of 15 fathoms, off a river where fresh water may be obtained. As far as Sarangani bay, the coast is generally low, and offers no good shelter.

Bukud point, formed by the hill of the same name, lies 18 miles E.S.E. of Pola point, and terminates in an islet united to it by a narrow reef. The hill may be easily recognised, being isolated in low land; seen from the west it suggests the form of a table.

Bual point, 20 miles E.S.E. of Bukud point, is surrounded by reef which is said to extend out to the distance of one mile. The charts hereabouts are said to be very inaccurate.

A reef, 2 miles long, and one mile wide, covered by 5 fathoms water, lies off the coast eastward of Bual point, and $3\frac{1}{2}$ miles S.W. by W. $\frac{1}{4}$ W. of Bulaluan point, the western point of Sarangani bay.

SARANGANI BAY has a width of 7 miles at its entrance between points Bulaluan and Sumban; its sides are very steep and its depth considerable. Anchorage may be found in the bights of its coastline, but close in, and with a hawser out to the shore to prevent the anchor slipping into deep water. A coral reef, extending one mile out, surrounds Bulaluan point, and borders the western and northern shores of the bay. The west coast is arid, the plains to the north-west and north are covered with *cogon* and abound in deer.

Macar is a military post on the western side of Sarangani bay, off which there is no anchorage.

The volcano Matutung which lies 19 miles N. by W. $\frac{3}{4}$ W. of the town of Mutul in the north-west angle of the bay, is very high, and can be seen from a great distance.

Mutul anchorage is in the angle of the bay north of the town in a depth of 15 fathoms. Good water can be obtained from the river. Communication between Mutul and lake Buluan across the mountains occupies two to three days.

Kanalasan cove (Inog bay), though steep, is the best anchorage in Sarangani bay during the S.W. monsoon; it lies east of Sumban point, before the village of Glan. Anchorage may be had in a depth of 11 to 13 fathoms with a hawser secured to the shore; but it is advisable not to anchor before the mouth of the river Glan, which flows into the eastern part of the cove, on account of the freshets. The town of Glan stands on the bank of the river, near its mouth.

LIGHT.—A *fixed white* light is exhibited from a tripod on the mole on the south side of the entrance of the Glan river; it is elevated 33 feet above high water, and should be seen in clear weather at a distance of 6 miles.

See chart, No. 2,575 [2,626], and plan of Kanalasan cove, No. 957 [2,646].

Sumban point is high and steep, with but little vegetation on it; the point is surrounded by a reef extending $2\frac{1}{2}$ cables to the west and north.

THE SOUTHERN PENINSULA of MINDANAO is elevated, and presents several remarkable peaks on it; the southern hill, 1,670 feet high, and in reality round, looks somewhat like a pyramid when seen on an E.S.E. or W.N.W. bearing. Seven miles N.E. by E. of this round-topped hill is a saddle peak, elevated 3,600 feet above the level of the sea; and N.N.E. of this saddle mountain there is a range, the highest peak of which, distant 13 miles, attains the height of 4,520 feet, and has a conical top when viewed from the southward.

The west coast, from Sumban point to Tinaka point, is generally clean, except near Bluff point, or Talayan point, where the reef extends nearly a mile out. Tukapanga point is rocky, high, and steep; a reef follows the coast to the south-east from the point to Batulaki.

Tinaka point, or Cape Sarangani, is a hill united to the coast by low land; it presents a bluff point to the south with a little sand-beach, and may be passed at the distance of half a cable; to the eastward of the point there is a large shoal of sand and rock, covered by a depth of $5\frac{1}{2}$ fathoms.

Anchorage.—On the western side of Tinaka point there is a small bay, Batulaki, open to the south-west, and fringed by shoals which reduce the available space to a width of 6 cables, in which there is a depth of 9 fathoms, lessening gradually to 3 fathoms, over a clean sandy bottom. Safe anchorage may be found in this bay, sheltered from the N.E. monsoon. The roadsteads of Balangunan and Malavinan to the eastward of Tinaka point are exposed to the sea, and afford very indifferent anchorage.

The coast.—Gual point is low and sloping, with a little reef off it. Points Kamalian and Silakay are foul. Butulan offers temporary anchorage out of the swell, but exposed to the sea that sets in from cross tides. The depth is great, with 14 fathoms almost touching the shore, and 10 fathoms before the mouth of the river. The coast continues clean and sloping, and almost straight to Baños point, which is about 72 feet high and peaked. From here it runs N. by E., with a series of high points to Kalian point, which is broad and rather remarkable. There is good anchorage off Kalian.

Tides.—It is high water, full and change, at cape Sarangani at 7 hours; springs rise 6 feet. The flood stream sets to the west between Tinaka point and the Sarangani islands, and the ebb to the east. On the coast to the northward and eastward it is said that the flood stream sets to the north, and the ebb to the south, the latter being less violent than

the flood; also that to the northward of Kalian point the tidal streams are weaker. Strong tide races and violent eddies are prevalent, especially off Baños point.

SARANGANI ISLANDS consist of two islands and a sand cay, situated 7 miles from the south point of Mindanao. The islands are separated by a deep channel $1\frac{3}{4}$ miles wide, reduced by a reef on the east side of Balut island to a navigable passage 8 cables in width. In this channel the tidal streams are very strong, the flood stream setting to the north and the ebb to the south. A shoal, covered by 7 fathoms, lies nearly in mid-channel, three-quarters of a mile from the coast of Sarangani.

Balut island, the westernmost of the two, is the highest and most cultivated; its population amounts to 1,500. In the centre is a volcano 3,117 feet above the sea*; from which smoke sometimes issues: seen from the north-west it appears between two peaks. At the south-western extreme there is another volcano, and towards the south-east a hill 1,083 feet high. The north and east coasts are bordered by a reef, which in some places extends out over a mile, while on the south and west sides the fringing reef does not extend so far. Off the south-west end is a rock 40 feet high. Lajan point, the north-east point of the island, is low and covered by mangroves; about $1\frac{1}{2}$ miles to the south of the point there is anchorage in a depth of 13 fathoms, sheltered from the S.W., but quite exposed to the sea from the N.E.; this is the only anchorage in the island. There is a hot spring on the shore here, covered at high water.

Sarangani island, or **Little Balut**, is composed of small undulating hills 490 to 820 feet high, covered with vegetation. There are three sheltered creeks on the west coast; the east coast is very foul.

Port Patuko, close to the north extremity of the island, offers sheltered anchorage in a depth of 8 fathoms; the stern of the vessel should be secured to the shore. The entrance may be recognised by a cliff of red earth a little to the northward of it: the channel is narrowed by reefs on both sides. Tiain point, one mile S.W. of port Patuko, may be recognised by white lime stains upon it; it can be approached with safety. A detached patch, with $4\frac{1}{2}$ fathoms on it, lies N.N.E. a quarter of a mile from Tiain point, and west of the entrance of port Patuko.

Port Tumanao, one mile south of Tiain point, has a depth of 25 fathoms at the entrance, diminishing to 9 fathoms at the head. Water can be obtained from a small rivulet in the south-east part of the port. Port Bolai is only fit for very small craft; neither wood nor water can be obtained.

* 2,350 feet in "*Challenger*" report, Vol. I., page 667.

See chart, No. 2,375 [2,626].

Olanivan islet is a small flat cay with trees on it, about a quarter of a mile across and 60 feet high, lying one mile N.E. by N. from the north point of Sarangani island; it is surrounded by a coral reef with a depth of 7 fathoms off its south-west edge. Between this reef and that fringing the north point of Sarangani is a narrow channel, which appears to be navigable.

DAVAO GULF has its entrance between Kalian point to the west and cape San Agustin to the east, some 30 miles apart; it runs about 70 miles inland to the northward. The island Samal largely occupies the northern part of the gulf. The shores of the gulf are, in general, clean and steep-to, but they have not yet been surveyed, and great discrepancies will be found among the existing charts. Much caution must therefore be used when navigating here.

West coast of Davao gulf.—From Kalian point the coast runs nearly north for 35 miles as far as Kasilaran bay, at the bottom of which is port Malalag; and from thence N.N.E. for 26 miles as far as the river Davao or Vergawa. The entire length of the coast is clean, and the water is very deep near the shore. Reefs project from the shores of Kasilaran bay, and port Malalag, which is stated in the Spanish Derrotero to be capable of holding vessels of any size; in the *Anuario Hidrografico* for 1887 port Malalag is said to be foul, and to require great care in entering.

Davao river and town.—The town was founded in 1847, and had in 1879 a population of 920; it continues to be small and of little importance. There is a bar at the entrance of the river on which the depth is $4\frac{1}{2}$ feet at low water springs. The channel is marked by two buoys, one painted black, the other white; within the bar there is a depth of 7 feet over a muddy bottom. When entering, the southern shore should be kept until a little creek opens on the port hand; then the northern shore should be hugged, as it is safe and very steep-to, while great banks of sand project from the southern shore. Discoloured water extends some distance from the mouth of Davao river during the ebb stream.

The light-tower at Davao consists of two uprights above a small house, height about 30 feet; the light formerly shown here is discontinued. The structure, painted white, is conspicuous, and is situated immediately eastward of a cocoanut grove about $1\frac{3}{4}$ cables eastward of the mouth of Pagpatayan creek.

Anchorage.—Off the entrance to the river, close inshore, the depth is over 20 fathoms; there is good anchorage in from 17 to 19 fathoms a little to the south-west, with the old light-tripod bearing N. $\frac{2}{8}$ E. and left extreme of Dumalag island S.W. $\frac{5}{8}$ W. Temporary anchorage may be found on a bank of sand in a depth of 8 fathoms at a distance of one cable

from the mouth of the river; but the best anchorage is farther north at 4 cables from the entrance, in front of some dead trees, in 11 fathoms, with the channel between the islands Samal and Talikut open, and point—or rather island—Dumalag shut in by Kabakan point. The bottom is exceedingly steep, and a shoal of sand projects $3\frac{1}{2}$ cables from the beach. These anchorages are good with northerly winds, but with the gales that occur during the S.W. monsoon, a heavy sea sets in, and then it is better to pass through the channel between Samal island and the main coast, and seek shelter near Pakiputan point, 5 miles north of Davao.

The fortnightly steamer, from Manila, Zamboanga, and Pollok, calls at Davao. Fresh provisions can be procured at Davao.

Tides.—It is high water, full and change, at Davao at 6h. 5m.; springs rise, 7 feet; neaps 4 feet. The stream turns nearly at the time of high and low water. At Davao there are two high and two low tides daily, affected however by diurnal inequality both in time and height. See App., page 569.

Samal island is about 18 miles long, N.N.W. and S.S.E., and 10 miles across the widest part. It rises in the north to a hill, 820 feet high, sloping gradually to the south by a series of hills of lesser height. The shore in many places is low, wooded, and fringed by narrow sand beaches, and in those places landing is practicable; but in other places, where it is broken up by rocky cliffs, the shore cannot be approached. The soil is fertile and excellent timber abounds. An islet with three high trees on it lies S.S.W. 6 cables from the north-west point of Samal, and is united to the shore by a bank of sand and rock covered by 3 feet water; a reef which partly uncovers at low water lies 3 cables south of the islet, and between the reef and the Samal shore there is anchorage in a depth of 4 fathoms. During N.E. winds shelter can be found in a wide bay between Linao point and Binulin river, nearly opposite Davao, in a depth of 8 to 11 fathoms. Malipano anchorage, 3 miles southward of Binulin river, is small, being confined by great reefs which leave only a difficult entrance; the entrance can be made out in clear weather, but at other times a pilot should be taken. Water can be obtained from a stream.

Talikut island, separated from the south-west part of Samal by a navigable channel one mile wide, is low, wooded, and marshy, lacking fresh water and uninhabitable. It is bordered by sand banks and rocky shoals, which are more extensive on the side next Samal island from the middle of the channel towards the south. This part of the shore should not be approached within a distance of 4 cables.

Cruz islands, off the north-east coast of Samal, are separated from it by a safe channel.

Pakiputan strait, between Samal and the main coast, should not be taken by a sailing vessel unless the wind is free, so that she can stem the current which runs generally with a velocity of $2\frac{1}{2}$ miles an hour. The strait is too narrow for a vessel to work in, and the coast of Mindanao is foul. The flood stream sets to the north, and the ebb to the south; there are generally counter currents, both on the coast of Mindanao and of Samal, and these are strongest when the tide is weakest, and they are not felt at all at springs. These currents can be made use of by masters of vessels having local knowledge.

Coast.—From Pakiputan point, which is covered by trees and dense mangroves, the coast runs nearly N.N.W. for 8 miles, and then N.E. as far as the river Hijo, and it is low all along here; anchorage may be found anywhere off it. The rivers Pannakan and Lassin are fronted by bars with very little water over them; fresh water can be obtained from these rivers. A low, isolated hill, presenting eight distinct peaks, rises between these rivers, and this hill is the only mark on the coast.

Tagun river, which enters the gulf between low banks covered with mangroves, has a depth of 10 feet on the bar at low water, and 23 feet within it. Schooners can ascend the stream for 5 miles; a large town is situated some distance up the river.

Hijo river enters the sea 7 miles E.N.E. of Tagun. It has very little depth of water on the bar, but is wide to the distance of 2 miles from the mouth. The banks of the river are low, marshy, and covered by mangroves. The town of Hijo is the most important in the gulf, and is said to contain a large population.

Kupiat and Pandasan islands lie respectively S.S.E. 3 miles, and S.E. by S. 4 miles from the mouth of Hijo river; they are covered by trees and mangroves, and are united together to the south-west by a reef. The passage between them and the mainland is only practicable by schooners. There is anchorage between the islands.

East coast of Davao gulf.—From Hijo river the coast runs nearly S. by E. as far as cape San Agustin. It is in general steep-to, and the reefs which border the various points along it do not extend seaward more than 2 or 3 cables. Anchorage may be found in the indentations, but exposed to the swell which sets in with southerly winds.

Sigaboy is only a small village; according to the Spanish Derrotero there is a road from the village to Pujada bay 12 miles distant on the east coast of Mindanao; wild cattle are plentiful and cheap. There is anchorage off Sigaboy in a depth of 4 fathoms, sheltered from southerly winds; the coast to the southward is foul.

Sigaboy island, separated from the main coast by a narrow channel, is covered with low wood and mangroves, and surrounded by foul ground. In December 1861, H.M.S. *Sphinx* anchored S.S.E. $\frac{1}{2}$ E. of Sigaboy in 18 fathoms, and found this anchorage very indifferent, with depths of $3\frac{1}{2}$ and 20 fathoms within half a cable's length. Wood was cut for burning in the furnaces, white and red poon, very hard and dry.

Burias shoal is circular, and 3 cables in diameter; it lies 5 miles N.N.W. of Sigaboy island, and 3 miles off the main coast. There is no further information about this shoal, except that the sea breaks over it.

Lanigan anchorage, 2 miles N.N.W. of cape San Agustin, is only fit for very small craft; it is partly sheltered from northerly and southerly winds by shoals on which the sea breaks. Good water can be had from a ravine to the southward of the anchorage.

CAPE SAN AGUSTIN,* the south east extremity of Mindanao, is formed by an agglomeration of black rocks with trees on the summit. A circular shoal of sand and rock, 4 cables in diameter, covered by $1\frac{1}{2}$ fathoms water, lies off the cape.

Large vessels should not come within 3 miles of the cape in bad weather, as there is always a heavy sea caused by the tidal streams and eddies off it. Small vessels, on the other hand, should close the cape and pass within a cable's length of the narrow reef that fringes it, so as not to be carried away to the southward by the current. The only shelter for large vessels is in Pujada bay. See page 390.

CURRENT.—Off cape San Agustin there appears to be a strong constant current to the south-west. In December 1861, H.M.S. *Sphinx* was set S. 44° W. 42 miles in 16 hours; in February 1875, H.M.S. *Challenger*, after passing to the eastward of the Sarangani islands, experienced a set S. 16° W. 38 miles in 24 hours; and in May 1882, H.M.S. *Lily* experienced a set S. 55° W. 65 miles in 24 hours.

ISLANDS BETWEEN MINDANAO and CELEBES.
Miangas or Palmas island, lying about 70 miles east of the south end of Mindanao, is about 300 feet high, and one mile in extent east and west; it is situated in lat. $5^{\circ} 35' N.$, long. $126^{\circ} 36' E.$ Anchorage may be had in a small open bay at the south-east part of the island, in a depth of 19 fathoms, with a flagstaff near the shore in the bight of the

* The definite geographical position of cape San Agustin has not yet been fixed. It has been placed by various authorities as follows:—

English and Spanish charts	-	-	Lat. $6^{\circ} 14' N.$	Long. $126^{\circ} 5' E.$
Raper and H.M.S. <i>Sphinx</i> , 1861	-	-	" $6^{\circ} 7' N.$	" $126^{\circ} 13' E.$
Horsburgh	-	-	" $6^{\circ} 17' N.$	" $126^{\circ} 0' E.$

See chart, No. 2,575 [2,626], with plan of Palmas anchorage.

bay bearing N.W., distant $2\frac{1}{4}$ cables; the shore reef extends off to the distance of about half a cable.

NANUSA ISLANDS.—(Meangis of Dampier).—The following report is from the *Challenger*, which passed to leeward of them in 1875, and dredged in a depth of 500 fathoms.

“**Nanusa island** (Merampi) rises gradually from the shore to a height of 666 feet, and is rounded gently at the summit, which appears bare, with the exception of some cocoanut palms along the ridge. Maroka, or Sueste island, a small peaked islet, 266 feet high, is the southernmost of the islands eastward of Kakarutan; the other islands of the southern group are low and flat, but, being densely wooded, can be seen at a considerable distance. There are cocoanut trees on both of them.”

The group was surveyed in 1886 by the Dutch gun-boat *Bali*. All the islands are surrounded by reefs; the three southern islands stand on the same reef. The chart shows a reef between Karaton and Gerama, the northern island; another 4 miles south of Karaton; and a third reef between Menkopu and the southern group. Karaton island is reported to be generally flat, but with a peak 200 feet high on its northern side; it is said to afford indifferent anchorage on its south-eastern side in a depth of 17 fathoms, sand, with the village of Karaton, bearing N.W. by W. distant a quarter of a mile, and the north-west point of Merampi N.E. by N. This is the only known anchorage among the islands, and is used by the Molucca trading steamer and the Government inspecting vessel on the rare occasions of visits to these islands. The number of inhabitants is 1,130; they live by fishing and cultivating maize and yams. Karaton, Merampi, and the small island Ourata near Maroka, are the only islands inhabited. Water at Karaton is very bad; it comes from an inland spring.

Current.—During the whole time the *Challenger* was dredging, 8 hours, there was a constant current to the south running at the rate of one mile an hour.

TALAUER ISLANDS are under the residency of Manado. Karakelang, the northernmost of the group, is 34 miles long north and south, 13 miles wide at the northern part, and has its southern end fringed by a reef nearly a mile wide. Off the edge of the west end of the above reef, in the passage between the islands Karakelang and Salibabu, there is a shoal with a depth of 7 fathoms. The southern part of the island is reported to be about 2,300 feet high. A sunken reef, with a depth of about 2 fathoms on it, lies $1\frac{1}{2}$ miles southward of Karakelang island, with the south-east extreme of South Saha island, bearing S.W. $\frac{1}{4}$ S., distant $2\frac{1}{4}$ miles.

Anchorage.—The trading steamers anchor off Beo, a town on the western side, with the flagstaff bearing S.E. distant about $2\frac{1}{2}$ cables, in a depth of 7 fathoms; this position is within three-quarters of a cable of the 3-fathoms line. In Samboara bay, 10 miles northward of Beo, there is temporary anchorage during easterly winds on the edge of the coast reef, at the distance of about $1\frac{1}{2}$ cables from the shore; the depth drops quickly from 8 fathoms to 30 fathoms and upwards. Water may be obtained from a stream running into the south part of the bay.

Salibabu island has a table-hill on it; the bay and anchorage of Salibabu, situated on the south-east side fronting Kaburuan island, have irregular depths of from 10 to 20 fathoms, rocky bottom, near the shore, and 20 to 40 fathoms, sand, about a mile off. There are many coral reefs in the bay, with deep water at their edges; and in the northern part of the bay or harbour, where there are breakers, the depth is less than one fathom at $4\frac{1}{2}$ cables from the shore. The best anchorage in the road is in a depth of from 15 to 30 fathoms, sand, about S.E. by E. of Salibabu village, and two-thirds of a mile from the northern shore. Approaching from the southward, a berth must be given to coral reefs that extend more than half a mile from the shore, about $1\frac{1}{2}$ miles south-eastward of the village of Salibabu.

From the eastern point of the island a spit projects with a depth of 30 fathoms near it, which depth continues along the north-east side of the island to the village Lirung, situated 2 miles north-west of that point. There is fair anchorage in a depth of 20 fathoms, sand, with the village bearing S.W. $\frac{1}{2}$ W. distant about 3 cables, but it is exposed to the tide which is strong. The Dutch trading steamers anchor off Lirung, and do not call at Salibabu anchorage. Temporary anchorage during north-easterly winds may be found in Seree bay on the west side of the island about 6 cables east of Seree village, in a depth of 20 fathoms, sand and stones, at a distance of one cable from the shore.

Supplies.—Hogs, goats, fowls, and sweet potatoes can be procured at Lirung, and there is a store kept by a Chinaman. Fresh water may be obtained from two streams running into Seree bay.

Kaburuan, the southernmost island, is low, but it has an insignificant peaked mount on it. The Dutch trading steamers call at Mengarang on the western side, but do not anchor.

Danger.—**Northumberland shoal** is shown on the Dutch chart as lying 6 miles S. by E. $\frac{1}{2}$ E. from the south point of Kaburuan; in the middle of the breakers a small patch of sand appears above water, and the extent of the shoal is about 2 miles N.N.W. and S.S.E. The captain of S.M.S. *Stosch* reported in 1883 that the bank extends further east and south than shown on the chart.

See chart, No. 2,575 [2,626], and plans, Nos. 2,193 [2,627] and 930 [2,621].

The **KARKARALONG ISLANDS** are reported as being six in number, besides four shoals, between lat. $4^{\circ} 45' N.$ and $4^{\circ} 9' N.$, and long. $125^{\circ} 3' E.$ and $125^{\circ} 45' E.$; viz. Ariaga or Saddle island, Meares or Haycock islands (two), Anda, Armadores, and Kabalusu. Except Armadores, these islands are all inhabited.

Ariaga is tolerably high, and appears at some distance from the eastward as two islands; a shoal extends some distance north-eastward from its eastern point.

Meares consists of two tolerably high islets, Kawio and Kamboling, which are connected by a coral reef that dries at low water. A reef projects about 3 cables from the north-west end of Kawio the northernmost islet which also dries at low water. On the west side of these islands fairly good anchorage may be obtained in a depth of from 10 to 20 fathoms, sand and coral, distant one to 2 cables from the shore reef.

There are strong overfalls about 2 miles S.S.W. of Kamboling.

Anda is low, and has a conspicuous tree in the middle of the island, and some small houses at the western end; a reef extends about 2 miles from the south-west point of the island; Armadores is also a low island.

Kabalusu, also named Haycock island, is the highest of the group.

Churruca shoal, about a mile long, and which breaks, was reported in 1881 by the *Churruca* as lying with Anda island bearing South and Ariaga island bearing West. Marie reef, which dries, was reported in 1884 by the German bark *Marie* to be composed of sand extending nearly one cable in an east and west direction, and showing the sea breaking heavily upon it; it lies with Anda island bearing S.S.E. $\frac{1}{4}$ E. distant 10 miles. Between Churruca shoal and Anda island strong eddies are said to exist. Iphigenia rocks are shown on the Dutch chart of 1888 as lying 7 miles S. by E. of Armadores. Huiberg or Haycock bank is shown on the same chart 16 miles W.S.W. of Kabalusu island.

Lipang island is shown as lying 14 miles N.N.W. $\frac{3}{4}$ W. of the north point of Sangir island, and Louisa bank as being situated 4 miles N.W. by N. of Lipang island.

SANGIR ISLANDS.—Under this name the Dutch include Sangir and all the islands southward to Biarro. They are of volcanic formation, and through them we trace the great volcanic band from the Malay to the Philippine archipelago. Sangir itself, the principal island of the group, is 24 miles long N.N.W. and S.S.E. It is under the residency of Manado in North Celebes, and is governed by the native Rajahs under the direction of a Contrôleur who is stationed at Taruna. There are a few Europeans and Chinese on the island, and in 1884 there were in the two groups, Sangir and Talauer, 29 government schools, and 23 missionary schools.

See chart, No. 2,575 [2,626], and plan of Kawio anchorage, No. 2,193 [2,627].

SANGIR is of moderate height in the southern part of it, but the northern part consists of high mountains; among them, a smoking volcano, mount Abu, at the north-west end, is the principal peak. A destructive eruption of mount Abu took place in March, 1856. Another eruption of this volcano took place on June 7th, 1892, when great destruction was wrought on the island. Some of the houses at Taruna were crushed by the weight of ashes that fell upon them, but the greatest damage occurred on the eastern side of the island, where over 300 lives were lost, and the coconut plantations were entirely destroyed.

On the western side of Sangir the two bays Taruna and Manganitu afford anchorage; while on the eastern side there is anchorage off Tabukan, in Petta bay, off Kulur, and in the bay of Miulu. There is little information about the small islets adjacent, on the north-east and south-east sides of the island, but according to Mr. McGill of the S.S. *Kongsu*, the islets shown on the chart off Beng Laut consist of seven pinnacle rocks.

Taruna bay runs in about $1\frac{1}{4}$ miles in an E.N.E. direction with a uniform width of half a mile; it is surrounded by wooded hills about 800 feet high. The northern side is clean except in the north-east corner, but the south side is fringed by a narrow reef. The depth is over 50 fathoms at one quarter of a mile inside the entrance, shoaling gradually to the head of the bay. The town is on the north side of the bay, and has a population not exceeding 1,000. The trade is almost entirely in copra, but sago banana, rice, maize, and cotton are produced, and the timber is said to be very good for building.

The anchorage is in 40 fathoms, black sand, with the northern entrance head bearing nearly west, the flagstaff of Taruna N.W., and a remarkable tree at the head of the bay E. $\frac{1}{2}$ N.; about one-third of a mile farther up the bay the depth is 26 fathoms. It is said to be safe in both monsoons.

Supplies.—No fresh provisions can be relied on; there is no information about the watering place; a branch steamer of the Netherlands India Company calls here about once a month but at irregular times.

Manganitu bay, about $1\frac{1}{2}$ miles southward of Taruna bay, is also surrounded by hills 800 feet high. It is $1\frac{1}{2}$ miles wide between the entrance points, the available space, however, being reduced to one half by an extensive reef that borders the southern and eastern shores. A detached reef is reported (1890) to lie with the north extreme of the islet at the head of the bay, bearing E. by N. $\frac{3}{4}$ N., and Kalingangin point N.N.W. A shoal, nearly a mile in extent, the position of which is doubtful, is charted as lying S.W. by W. $1\frac{1}{2}$ miles from Kalingangin point, in the approach to Manganitu bay.

See chart, No. 2,575 [2,626], and plan, No. 930 [2,621].

The native town Manganitu is on a river near the head of the bay, before which there lies a bank with a little islet on it; landing is difficult. The anchorage is in a depth of 24 fathoms about half a mile from the shore, with the native town bearing E.N.E., and the south-west point of the bay S. by W. Good water is procurable.

Tides.—It is high water in Manganitu bay at 5 hours; springs rise about 6 feet. The tidal stream is weak and irregular; there appear to be four tides in the 24 hours. Along the coast the tidal streams are said to reach the rate of 2 miles an hour.

Tabukan road affords anchorage in a depth of about 12 to 16 fathoms with the flagstaff at Tabukan village bearing S.W. by W., distant $3\frac{1}{2}$ cables. The depth increases very rapidly north-westward of this position, but gradually towards the shore southward, and also in the direction of a sand spit distant 2 cables south-eastward, which projects $2\frac{1}{2}$ cables from the shore.

Petta anchorage, 3 miles south of Tabukan, is only one cable wide at the entrance between the coral reefs extending from either shore; the edges of the reefs are marked by two nun buoys, that on the starboard hand entering being coloured white, and the buoy on the port hand, red. To enter, keep the cylindrical shaped beacon upon a hill, 360 feet high, behind the village of Petta, in line with a beacon on the shore in the form of a cross, bearing S. 39° W.; the anchorage is immediately within the buoys in a depth of 18 fathoms, sand.

Kulur anchorage is at the mouth of an indentation in the coast about 2 cables in width, and penetrating about half a mile to the south-west; about two-thirds of the inner part of the bay is occupied by shoal ground. The depth is 16 fathoms midway between the entrance points, at the distance of a cable from the 5-fathoms contour-line.

Miulu anchorage is fronted by Tegang, Batu Wingko and other islets, of the passages between which there are no particulars. There appears to be anchorage off the northern part of the long straggling town of Miulu, in a depth of 18 fathoms, at about 3 cables from the shore, which is fringed with a sand flat to the distance of more than a cable.

Karakitang or Passage islands, consist of six or seven islands and several rocky islets, lying between the south end of Sangir and Siau, separating the channel into two branches. The northern branch or passage between Kalama and Kima off the south end of Sangir is 8 miles wide and considered clear of danger. The southern channel between the rocks Sangaluan and the northern point of Siau is also reported clear; but as the vicinity of these islands has not been examined they should be approached with caution.

Siau island has a remarkable range of volcanic cones, perfectly distinct from each other. The northern one is an active volcano 5,924 feet high; the other three are lower, decreasing gradually to the lowest in the southern part of the island, where, to the south-east, the land appears much broken up. There is anchorage off Ulu village on the eastern side, about $1\frac{1}{4}$ cables from the shore, in a depth of about 30 fathoms, with Gunong Api in line with a stone pillar near the shore bearing N. 16° W. There is also anchorage off Sawan in a depth of 15 fathoms, sand and rock, with the market house bearing N. 82° W., and a small rock northward of Timokolang point S. 48° E.; this anchorage, more especially during the south-east monsoon when the wind is mostly South, is better than that of Ulu. A broad reef juts out northward from Timokolang point, outside which is the small rock (about 15 feet high) just mentioned. Though Siau is thickly populated, provisions such as pigs, poultry, eggs, cocoanuts and bananas can only be procured with difficulty.

Pondang and Mahoro islands, with smaller islets and rocks between them, extend eastward from Timokolang point the south-east extreme of Siau island. Gunatin island, about a mile to the northward, has rocks rising above water at the distance of a cable from its northern shore.

Makaleheh, situated 9 miles westward of Siau island, is 394 feet in height, round-backed and wooded.

Tagulanda island has two peaks, both round-backed, showing as one when seen from the south-east. The eastern and highest peak, 2,550 feet above the sea, is generally hidden by clouds during the south-east monsoon; the western peak, 2 miles to the west of the higher one, is 2,440 feet high and more abrupt. From these peaks the island gradually slopes to the westward, and forms a point which is surrounded by a reef extending about a mile in all directions from it. The principal village and trading establishment is on the south side of the point. There is also a village in a bay on the northern side of the island, said to be frequented during the north-west monsoon, when the western side is unapproachable. The southern and eastern sides are much steeper, and appear to have deep water off them.

Anchorage.—The Dutch steamers, which visit the island occasionally to collect copra, anchor outside the reef, three-quarters of a mile S.E. by S. of the village, in a depth of 18 to 24 fathoms, with the eastern extreme of Ruang island in line with the eastern extreme of Biarro.

Between Tagulanda and Ruang islands there is a narrow channel through which the tide runs strongly; breakers were seen in it, but whether due to tide rips or rocks was not determined.

Ruang island is formed by an active volcano, which rises in a cone to a height of 2,330 feet; three pinnacles rise from the edge of the crater,

See chart, No. 2,575 [2,626], and plan, No. 2,193 [2,627].

showing as two only when seen from the westward. The shores of the island appear to be steep-to, except in the channel separating it from Tagulanda, where foul rocky ground projects $1\frac{1}{2}$ cables, and on the west side of the island where a reef extends to the distance of 3 cables. The eastern point is low, and there is generally a tide race off it. There is no water on the island, and it is only occasionally inhabited by fishing parties from Tagulanda. Ruang island summit is in lat. $2^{\circ} 18' 20''$ N., long. $125^{\circ} 21' 36''$ E.

Anchorage.—H.M.S. *Flying Fish* anchored, while taking observations in a depth of 22 fathoms, at three-quarters of a cable from the black sandy beach on the north-east point, but a slight swell setting in, her anchor slipped off the steep bank; vessels anchoring there should secure by a hawser to the shore.

Passigi island is about half a mile in diameter; it is flat, covered with trees about 100 feet high, and surrounded by a coral reef which extends a quarter of a mile from its southern shores from south-east to south-west, and $2\frac{1}{2}$ miles to the north-east. There appeared to be an entrance through the reef on the north-east side: the channel between Passigi and Tagulanda, about half a mile wide, is clear and deep.

Biarro island is $5\frac{1}{2}$ miles long N.E. by E. and S.W. by W., and $2\frac{1}{2}$ miles wide; it is wooded and traversed throughout its length by a range of hills about 800 feet high, rising on the east side of the centre to a remarkable and precipitous hill with a thumb-like summit 1,245 feet above the sea. Off the south-west point is a small wooded islet about 200 feet high. The western coast is broken by bays with islets before them. A pillar rock, 30 feet high, stands off the north-west point which is low, and should not be approached within $1\frac{1}{4}$ miles, as a coral shoal here, which has not been surveyed, should be avoided.

On the north side of Biarro there is a wide bay which affords anchorage in the S.E. monsoon in a depth of 6 fathoms close to the reef, on the west side of the bay, with a small red-topped islet in line with the summit of Biarro, bearing S. by E., and the extremes of the bay N. 80° E. and S. 88° W. Care must be taken on approaching this anchorage as the water shoals suddenly, and the reef does not show when covered and when the water is smooth. About half a mile west of this anchorage is the entrance to a creek leading to a large village.

The north-east point of the island consists of high cliffs with a pillar rock off it, and half a mile N.N.E. of it are rocks which uncover 3 feet at low water. The coast facing the south-east is cliffy and steep-to.

NORTH-EAST COAST OF CELEBES.—**Banka island**, which is inhabited, is $6\frac{1}{2}$ miles long and $4\frac{1}{2}$ miles wide, of irregular shape and densely wooded, with the exception of several clear

spaces of coarse grass. The summit is on the eastern side, 1,135 feet above the sea; to the west of it are several round-topped conical hills, ranging from 600 to 700 feet in height. The north point of the island is formed by low mangroves; a rock, 14 feet above water, named Batu Kapal, rises at 2 cables from the point, and is connected with it by a coral reef. The eastern point of the island is a sharp, conical hill 350 feet high, wooded, and joined to Banka by a low neck of land. To the north-east the point ends in a succession of sharp needle rocks, the outermost of which are surrounded by water, and are 15 to 20 feet high. The south point of the island is a low cliffy point, rising to a conical hill 280 feet high, with an islet of similar shape to the north-east of it, from which a breaking reef extends more than half a mile south-eastward, with deep water close to it. There are heavy tide rips off the point, and a wide berth should be given it. The west coast of the island is low, and fringed by coral, extending about a cable from the shore.

The western point of the island is a low dark red cliff with trees upon it; to the northward of it is a bay with soft muddy bottom, which is the only place among these islands where a ship can be beached. To enter it a boat should go ahead of the ship, as the entrance is intricate and narrow; a small stream enters at the head of the bay.

Kinabohutan island is low and wooded, with a mound about 60 feet high on its southern side. It is surrounded by a reef, half a cable wide and steep-to off the south-east point; extending to a third of a mile from the east shore; while on the north-west side, it nearly joins the reef of Talisse island, leaving only a narrow channel of 3 fathoms depth, too narrow and intricate to be used by ships. The channel between Kinabohutan and Banka islands is 3 miles long and one mile wide, and was constantly used by the *Flying Fish*.

Talisse is a high narrow island nearly 6 miles long with a central peak 1,168 feet high. It is thickly wooded, with patches of cleared land, and occupied, along with Kinabohutan, by the Molucca Trading Company (*Molukse Handel Vermootschap*) who are growing coffee, cacao, vanilla, and cocoanuts. A species of iron-wood is also grown here, which will give straight piles 100 feet long, good for piers; but it is too heavy for spars or for ship's use, and will not float in sea-water.

The north-east point of the island, Tanjong Aros, is a bold cliff with large broken rocks at its base, and steep-to; the north side is fringed by a coral reef which extends generally to a quarter of a mile from the shore, with deep water close to it. The south-west point, Tanjong Bung, is of sand and mangroves with a great square rock off it, 10 feet above water; the reef off it extends nearly half a mile westward, but only a quarter of a mile to the southward. The south-east point is a sand spit, with a reef off it which projects a third of a mile to the eastward. From the south-east

point to the station, $1\frac{1}{2}$ miles to the north-east, the shore is low, covered by mangroves and fringed by a reef one to 2 cables wide.

Talisse road, between the south-east point of Talisse island and Kinabohutan island, affords good anchorage in a depth of 10 to 12 fathoms, with the wooden jetty bearing about N.W. by W. and the north-west tangent of Kinabohutan island N.E. The jetty is of wood, too slightly built to secure ships to; the piles are not coppered, and in 1886 were so decayed that the jetty was not safe. The depth at the head of the pier is 4 fathoms at low water, and at 20 yards within the end there is only 6 feet. The house of the manager of the Molucca Trading Company is near the jetty.

Shoals.—To the north-east of the jetty the fringe reef extends generally to little more than a cable from the shore, but at one-third of a mile E. $\frac{1}{2}$ N. from the shore end of the jetty there is a patch of 9 feet at 2 cables from the shore with a depth of 6 fathoms close to it; and at three-quarters of a mile in the same direction there is a patch detached from the Kinabohutan reef with less than 6 feet on it, towards which the flood stream sets strongly.

Clearing mark.—Cape Coffin, in line with the western extreme of Banka, will clear the coral shoal west of Kinabohutan island.

Tides.—It is high-water in Talisse road, full and change, at 6h. 45m.; springs rise 7 feet, neaps $5\frac{1}{2}$ feet. The flood-stream sets to the northward between Talisse and Banka, and to the westward between Talisse and Tindila.

Supplies are not to be depended on, but sometimes cattle are put on the island to graze, which can then be purchased: vegetables come from Likupang. Water is obtained from a stream at the back of the manager's house, but the supply is scanty and liable to be contaminated. In 1886 there was a small quantity of coal for sale, but the supply was not likely to be kept up, and there are no facilities whatever for coaling.

Tindila island is half a mile long north and south, and 2 cables wide; the northern part is rocky and has a clump of trees on it 250 feet above the sea; the southern part ends in a wide beach of white sand—the observation spot of H.M.S. *Flying Fish*. A reef extends from it 4 cables to the westward. The channel between Tindila and Talisse is 4 cables wide, has a depth of 15 fathoms, and is clear of all danger. The channel between Tindila and Ganga is only fit for boats.

Position of observation spot: lat. $1^{\circ} 47' 21''$ N., long. $125^{\circ} 2' 40''$ E.

Ganga island is about $1\frac{1}{2}$ miles long and half a mile wide, rocky and wooded, with a clump of trees 330 feet above the sea on the southern part. The eastern side is steep-to, but the southern and western sides are

fringed by a reef, while the southern extreme is surrounded by a bank which slopes gently from 4 fathoms to a depth of 10 fathoms. It is advisable to give a wide berth to this point, as the flood stream to the westward sets directly on to it, and then branches off to the northward and westward.

Lihaga, a small wooded islet to the westward of Ganga, is 109 feet high, and fringed by a narrow reef steep-to on all sides but the northern, from which shoal-water extends to a distance of 2 cables. The channel between Lihaga and the nearest point of the Likupang shore is $1\frac{1}{4}$ miles wide.

BANKA STRAIT, or LIKUPANG STRAIT, 12 miles long from North cape to cape Coffin, presents no difficulties: a straight course through from one entrance point to the other will pass north of Korrier rock (*see* p. 419), which is the only danger for vessels under 20 feet draught, while vessels of greater draught may pass through in not less than 8 fathoms by following the directions given further on. The tide sets fairly through the channel at the rate of 2 to 3 knots at springs.

North cape is rocky and thickly wooded to the water's edge, the tops of the trees being about 100 feet above the sea. The land slopes gently upwards from the point to a hill 825 feet high, one mile to the southward, which is the general height of the land at the same distance from the shore all along the north coast. The point is fringed by a coral reef not more than 40 yards wide and very steep-to, and on its eastern side there is a beach of white coral.

On the western side of the point Kora Kora inlet penetrates to the southward for 2 miles, and from there the coast trends S.W. for 15 miles to Pisok point, the northern point of Manado bay; the shore throughout this distance is low and covered by mangroves to the water's edge, and is broken by several creeks in which are fishing villages. The survey by the *Flying Fish* ended at cape North, but she passed along the coast to Manado bay and found the chart generally correct.

Tanjong Bohoi, situated about 3 miles E.S.E. of North cape, is a low rounded point with trees on it 100 feet high, similar to North cape, and fringed like that point by a reef 40 yards wide, on which the trees grow out beyond high water mark. At one mile W.N.W. of Tanjong Bohoi is the entrance to a circular bay, half a mile in diameter and lined with coral, with a depth of 5 fathoms in the middle.

Likupang road.—From Tanjong Bohoi, the coast trends S.S.W. for $2\frac{1}{4}$ miles, and then takes an E. by S. direction for 8 miles, forming a bay, the western part of which contains two low islands and several shoals and reefs extending to a distance of $1\frac{1}{4}$ miles from the coast; the shore is clothed with mangroves and fringed with coral. The road is well sheltered

See plans, Nos. 930 [2,621] and 2,194 [2,631].

during the S.E. monsoon, and free from the swell that is felt at Talisse anchorage in that season.

Likupang town, at the mouth of the river of the same name, is controlled by a Dutch *posthouder*, and is in communication with Manado by a good road. The river is very shallow, and at low water boats cannot approach within a quarter of a mile of the beach. At one mile N.E. by E. of the river there is a point with a single tree on the reef, and one mile further east a point formed by trees reaching out to high-water mark; the shore here is fringed by coral, and shelving. At $1\frac{1}{2}$ miles east of this last point there is a pyramidal black rock, 18 feet high, connected at low water with a steep cliffy point about 300 feet high.

Anchorage.—The best anchorage is in a depth of 7 to 9 fathoms, sand, with Likupang flagstaff S.W. distant $1\frac{1}{4}$ miles, and Tanjong Bohoi bearing N.W. $\frac{1}{4}$ W.; small vessels can anchor close in, but care must be taken not to shut in the 18-foot rock by the east point of the bay, as the ground inside is very foul.

Supplies are scarce, but with a day's notice fowls, vegetables, and, generally, a bullock can be procured; the water in the river is very good.

Communication.—There is postal communication twice a week to Manado, overland.

Cape Coffin is a bold point with large boulders off it, and a narrow fringe of coral which can be passed with safety at the distance of a quarter of a mile; there is generally a tide-race off the point. From the cape, the land rises abruptly to a high table-land, 1,016 feet high, a mile long and thickly wooded, easily distinguished from all sides by its square box-like aspect. Mokotamba point, $1\frac{1}{2}$ miles westward of the north extremity of cape Coffin, is steep and cliffy, about 200 feet high, and surrounded by huge boulders extending seawards about one cable; the water is shoal to the distance of about 2 cables from this point.

Shoals in Banka strait.—**Korrier rock** is of white coral, covered by $2\frac{3}{4}$ fathoms least water, and is generally indicated by tide rippings; the shallowest part is a quarter of a mile long E.N.E. and W.S.W. and is very flat; from it Likupang flagstaff bears S. 41° W., Ganga summit N. 32° W., and the northern extreme of cape Coffin S. 80° E. The shoal is steep-to on its east and south-east sides, and shelves gradually to the northward and westward; on its west side are lumps of mushroom coral.

A shoal reported to have only $3\frac{3}{4}$ fathoms on it, but on which the *Flying Fish* found not less than $5\frac{1}{2}$ fathoms, lies with cape Coffin bearing S. 57° E., Likupang flagstaff S. 40° W., and North cape N. 81° W.

A bank $1\frac{1}{4}$ miles long N. by E. and S. by W., and three-quarters of a mile wide at its north part, with a general depth of 7 to 9 fathoms, and

a least depth of $5\frac{1}{2}$ fathoms towards its southern end; lies with cape Coffin bearing S. 51° E., Likupang flagstaff S. 32° W., and North cape N. 89° W., from its shoalest part.

A shoal $3\frac{1}{2}$ cables long N.N.E. and S.S.W. and 2 cables wide, with its least depth $4\frac{1}{2}$ fathoms, lies with cape Coffin S. 68° E., Likupang flagstaff S. 15° W., and North cape N. 76° W.

A shoal 2 cables long north-west and south-east, and one cable wide, with $2\frac{1}{4}$ fathoms least depth, lies with the north point of cape Coffin bearing S. 84° E., Likupang flagstaff S. 8° E., and Tanjong Bohoi N. 51° W. This is the northernmost of the reefs west of Likupang road.

All these shoals are of light colour, and can be seen in clear weather at a distance of half a mile.

The Dutch chart of 1887 shows a 4-fathoms patch $1\frac{1}{2}$ miles N. by E. of Likupang flagstaff.

Tidal streams.—The flood stream runs fair through the strait between cape Coffin and Banka island, at the rate of 2 to 3 knots at springs. It divides to the south-east of Ganga island, part of the stream continuing to set west, turning to N.W. and north after passing North cape; the remainder turns to the northward, running to the north-west through the passages between Ganga, Tindila and Talisse, and to the north between Talisse and Banka. The flood stream on the west side of Talisse runs due north, and, meeting the stream from between Talisse and Banka, forms a tide-rip which is met with 3 miles to the north-west of the north point of Talisse. The ebb stream runs between the islands to the south-east and fair through Banka strait. Tide-rips are formed off all the salient points, and there are heavy races to the northward and north-eastward of Banka.

DIRECTIONS for BANKA STRAIT.—**From the Westward.**—North cape may be passed at a distance of a quarter of a mile, and then a course E. $\frac{1}{2}$ S., keeping the south end of Nain island just open of North cape, will lead clear of all dangers, with 8 fathoms least water, until the east end of Talisse and the west point of Banka are in line; a course may then be steered to pass a quarter of a mile from cape Coffin.

If intending to anchor at Likupang, after passing North cape, a S.E. course should be steered, and North cape should not be brought to the northward of N.W. by W. $\frac{1}{2}$ W. until the eastern extreme of Talisse is in line with the western point of Kinabohutan, when a S.S.E. course will lead to the anchorage.

If intending to anchor at Talisse, the south point of Ganga island must be given a berth of three-quarters of a mile.

To make for Talisse anchorage by the passage between Talisse and Tindila from the north-west:—Bring the square hill of cape Coffin in the gap between Tindila and Ganga, and steer for it until the summit of Banka

is in line with the hill 789 feet high (a round hill with trees on the top) bearing E. $\frac{1}{4}$ S.; then steer for the summit of Banka on that bearing, opening the Banka summit to the northward of the hill on approaching the north point of Tindila; when Lihaga is seen between Tindila and Ganga the anchorage off the Talisse pier may be steered for.

To pass through the channel between Banka and Kinabohutan from the northward, the west point of Banka island (a low cliff topped with trees) should be steered for, bearing South, until the summit of Manado Tua is in line with the south extreme of Talisse island; a S.W. by S. course then leads through the channel in the deepest water. If intending to anchor at Talisse:—Manado Tua with its breadth open south of a cleared patch on Talisse, leads over the shoal water S.E. of Kinabohutan in a depth of 8 fathoms; when cape Coffin is open of the right extreme of Banka, the pier at Talisse may be steered for.

From the Eastward.—From cape Coffin, which may be passed at the distance of a quarter of a mile, steer for the gap between Ganga and Tindila islands till the eastern extreme of Talisse and the western point of Banka are in line, and do not open them till the south tangent of Nain island is just touching North cape, bearing W. $\frac{1}{2}$ N.; then steer for North cape on that line, which will lead clear of all dangers. If intending to anchor at Likupang, the point next westward of cape Coffin may be passed at the distance of half a mile; the course should then be altered to the southward till the rocks off the point are in line with cape Coffin, E. $\frac{1}{2}$ N., and hence continued on these marks to the anchorage.

COAST.—From cape Coffin, the general direction of the coast is S. by W. $\frac{1}{4}$ W., for 5 miles to the head of a bay with a river in its southern angle, and terminated to the southward by cliffs 300 feet high, pierced by curious caverns. This reach of coast consists of long steep beaches of coarse black volcanic sand, the favorite resort of those singular birds, the Maleos, which in the dry seasons deposit their eggs in the sand just above high-water mark. The country behind is hilly and wooded.

Batu Bundita is a sharp pointed rock with a white top 30 feet high.

Pulo Kalinaon is an islet 250 feet high, wooded, and joined to the mainland by a reef, which also extends nearly a quarter of a mile to the southward.

Pulo Mogogimbun is a small, wooded, conical island, 163 feet high, lying one mile E. by N. from the perforated point. The south side of the island is steep and cliffy; a reef extends northward from its north side to the distance of about half a mile, with five rocks upon it showing 2 feet above high water, and several others awash.

Anchorage.—There is good anchorage in the bay west of Mogogimbun island, protected from swell and southerly winds, in a depth of 17 fathoms, shoaling gradually to 3 fathoms close to the beach. The *Flying Fish* anchored with Mogogimbun island bearing East, Batu Bundita N. by E. $\frac{3}{4}$ E., and a remarkable cavern S. $\frac{1}{2}$ E.

Coast.—From the perforated cliffs above mentioned the coast trends in a south-easterly direction for 8 miles to the northern entrance of Limbé strait. The northern part of this stretch consists of a long black sand beach with native huts on it. The southern part is low, rocky, and thickly wooded, rising continuously at the back to the summit of the Sisters. Two pillar rocks, 40 feet high, stand off the northern entrance point to Limbé strait, and a reef extends half a mile to the northward and eastward, with several rocks under water at its edge.

During the survey, the *Flying Fish* anchored in a small bay to the north of Verbrandt point, the north point of entrance to Limbé strait, in a depth of 17 fathoms, with Batu Kapal bearing N. 54° E., the cone on the eastern slope of Gunong Batu Angus S. 65° W., and the pillar rocks S. 26° E.

Volcanoes.—Mount Klobat is a very conspicuous cone standing by itself, rising to a height of 6,694 feet from a low base in the north-east extremity of Celebes island. Gunong Sudara or the Sisters, a double peak about 8 miles E. by N. $\frac{1}{4}$ N. of Klobat, is 4,300 feet high; the eastern peak is a little lower than the western. Gunong Batu Angus, 10 miles E.N.E. of Klobat, and 3,846 feet high, has a more rounded summit than Gunong Sudara; a crater has opened on the eastern slope of it at about 2 miles from the summit, and $1\frac{1}{2}$ miles from the sea. This is a cone of loose ashes 1,433 feet high, of regular shape, whence a small lava stream has issued, forcing its way through the forest to the sea. That it is of quite recent date is evident, for in 1886 the ashes and lava were devoid of all vegetation save a few patches of coarse grass.

During the S.E. monsoon these hills are generally clouded after 8 a.m. to a height of 3,400 feet above sea level, but it was noticed that Klobat often remained clear while the mountains more eastward were covered.

LIMBÉ ISLAND.—The northern end of Limbé island was surveyed by H.M.S. *Flying Fish* in 1885; it is very narrow and shows a range of hills about 600 to 700 feet in height, well wooded, precipitous, and steep to on both sides. The northern point terminates in sharp pinnacles with a detached rock 84 feet high (Batu Kapal), white from bird droppings; from this rock a line of detached rocks extends $2\frac{1}{2}$ cables N. by E., over which the sea breaks; the outer rocks, about 6 feet high, always show above water.

The N.E. point of the island is a wedge-shaped cliff about 200 feet high, similar to the north point. This point and Batu Kapal may be rounded in safety at the distance of half a mile. There is always a strong tide-race off the point.

The southern and eastern parts of Limbé have not been surveyed. The centre of the island is about 1,500 feet high. The eastern side is high and cliffy and appears to be steep-to.

Sandy island, encircled by reef, lies about three-quarters of a mile off the south-west end of Limbé island at the entrance to the strait; there is a detached rock, about half a cable in extent and covered by 5 fathoms water, lying N. by W. $\frac{3}{4}$ W. distant 3 cables from its north point.

Limbé strait is narrow and somewhat intricate; it is about 12 miles long, and in the middle there are two islets encircled by reefs which cause a tidal eddy. The channel west and north of the islets is said to be the best, but the tides are very strong, and it is not advisable to pass through the strait in a large vessel. In the south part of Limbé strait there is good anchorage and shelter from S.E. winds when these blow into Kema road.

KEMA, which is situated about 5 miles from the entrance of Limbé strait, forms a useful complementary port to Manado, according to the prevalent monsoon; from April to November ships anchor off the latter place, which is quite protected from easterly and southerly gales, while from November to April the anchorage at Kema alone is used. A good road connects the two ports.

There is a pier in the middle of the beach at which boats can land at high water, but the best landing appears to be at the southern part of the road, where there is some shelter from the swell that breaks heavily on the beach when the sea breeze sets in.

Anchorage.—There is anchorage in a depth of 6 fathoms, about a quarter of a mile from both landing places, with mount Klobat bearing N.W. by N., and the gap between the two peaks of Gunong Sudara N.N.E. $\frac{1}{2}$ E. Anchorage may also be had further out in 10 to 12 fathoms.

Supplies.—Food, water, and provisions of all kinds are abundant. The government keep a very small supply of coal here, but a ship is entirely dependent on her own means for getting it off, and no large lighters are procurable.

Communication.—Vessels of the N. I. Company call at Kema once a month from Makassar and Manado to Gorontalo, reversing the route every other month; *see* page 30.

EAST COAST.—From Kema, the coast trends S. by W. for 13 miles to Atep point, and then S.W. by S. for another 13 miles to the Bentenan islands, a group consisting of five islands and four small islets,

See plans: Limbé strait on 930 [2,621] and Kema road, 2,194 [2,631].

the largest of which is 500 feet high. Pakalor, the outermost islet, lies $2\frac{1}{2}$ miles from the shore; at 2 cables south-eastward of Pakalor there is a small detached rock upon which there is less than 6 feet, with depths of 13 to 19 fathoms surrounding it. The country to the southward of Kema is composed of high ranges of hills about 4 miles inland, with many tiers of densely wooded even ridges, which descend to the sea in long tapering slopes; the beach is occasionally broken by small cliffs.

Belang bay, about 6 miles south-west of the point abreast of the Bentenan islands, affords anchorage in a depth of 16 fathoms at 4 cables from the shore, with the flagstaff bearing W.N.W.; within this distance the depth appears to decrease regularly towards the shore. The port having increased in importance by the development of commerce, has been opened for general trade to vessels of all nations, under the usual regulations incident to the trading ports of Netherlands India.

Current. — Between Limbé and Tifori islands, during the S.E. monsoon the current was always found setting to the northward at the rate of from one to 2 miles an hour.

WEATHER.—In July, August, and September, in Banka strait, the general direction of the wind was between S.S.E. and South; force 2 to 3 during the day; light air and calms during the night; a few showers occurred, but there were no really wet days. There was one blow from the southward, force 4 to 6, which lasted 48 hours, and generally a squall out of Limbé strait. The weather was never very clear, except in the early morning, and the tops of the mountains were generally in the clouds. In the latter part of August, and in September, the weather became thicker, and during the latter part of September the land could seldom be seen more than a few miles. The average temperature was 82° Fahrenheit.

NORTH COAST of CELEBES.—MANADO BAY.—

The land to the northward of the bay is high, but terminates in a low mangrove point, cape Pisok, bordered by a reef which is steep-to and projects nearly three-quarters of a mile to the westward; the reef continues as a narrower fringe along the north shore of the bay to near the town of Manado. Off Tokabene point (on which there is a beacon), 6 cables south of Manado fort, a shoal spit projects to the distance of $3\frac{1}{2}$ cables. A reef is said to extend along the south shore. The whole bay is steep-to, the depth decreasing suddenly in a distance of 6 cables from 150 fathoms to 60, 10, and one fathom.

Although the bay itself is spacious and free from danger, it only affords an insecure anchorage, fully exposed to westerly winds, which sometimes prevail with great force, and last for some days, sending in a heavy sea,

See chart, No. 2,575 [2,626], and plan, No. 2,194 [2,631].

especially in the months of November, December, January, and February ; therefore, during the north-westerly monsoon, from October to April, any vessel visiting this part of Celebes is obliged to anchor at Kema, on the eastern side of the peninsula, whence goods are conveyed overland to Manado. During the south-east monsoon the wind sometimes blows into the bay between 9 a.m. to 4 p.m., but for days does not overcome hard winds from the South, called *Selatan*.

MANADO is the chief town of the Minahasa district, the seat of the Residency, and is one of the prettiest and cleanest towns in the East. It looks like a large garden with rows of rustic villas, the broad paths between them forming streets. Good roads branch off in several directions towards the interior, with a succession of thriving plantations. To the west and south the country is mountainous, with groups of fine volcanic peaks 6,000 or 7,000 feet high. Manado is a free port ; the exports are coffee, spices, and vanilla. Population in 1898 numbered 11,039, of whom 430 were Europeans.

LIGHTS.—From an iron framework support, situated on the beach to the southward of the mole head, near fort Amsterdam, is exhibited a *fixed white* light, visible in clear weather from a distance of 10 miles.

A *fixed red* light is shown at the head of the mole.

Anchorage.—The best position is south of the mouth of the Tikala river, with the north side of fort Amsterdam bearing S.E. by E. and the wooden jetty a little to the southward of East. The south side of the river is marked by a white beacon surmounted by a ball, and there is a similar beacon on Tanjong Tokabene. The anchor should be dropped in a depth of not less than 30 fathoms, and as the holding ground is bad, being very steep and consisting of loose sand, a stream anchor should immediately be laid on the reef to prevent the vessel being driven off with the land wind which generally commences at 4 p.m. There are three anchors buried in the sand to which hawsers can be made fast, and trees within workable distance are also available for the purpose.

Communication.—The Netherlands India steamers call here twice a month during the south-east monsoon, from 15th April to 15th November ; during the westerly monsoon they go to Kema.

Supplies.—Provisions of all kinds can be obtained in abundance. Water can be obtained from the river, but boats must go well up the stream beyond the first fork to obtain it pure. A water-conduit, from whence ships can supply themselves with drinking water free of charge, is laid from a well in the vicinity to the extremity of the mole.

Tides.—It is high water, full and change, at Manado, at 6h. ; springs rise 6 to 8 feet ; neaps 2 feet.

See plan of Manado bay, No. 930 [2,631].

Coast.—To the westward of Manado the coast has not been surveyed, and there is very little information about it. The chart shows the shore between Kalapa point, 14 miles south-west of cape Pisok, and Tetapean islet at the entrance of Amurang gulf, 11 miles further to the south-west, to be bordered by reefs to a distance of 4 miles.

Amurang bay, at the south-east end of Amurang gulf, affords sheltered anchorage close in, but in very deep water, 33 fathoms at the distance of about one cable from the shore, with a conspicuous tree near the town flagstaff bearing S.E. by S. It is necessary to use a shore fast as at Manado. Immediately westward of the anchorage the shore reef extends out nearly a cable's length from the beach. Amurang is a free port.

Communication.—Steamships of the N.I. Company call once a month on the voyage from Makassar and Toli Toli to Manado.

Islands West of North cape.—**Nain island** is one mile long, north and south, and about half a mile wide; when seen from east or west it appears saddle-shaped, the northern summit being the highest, 765 feet above the sea. The island is surrounded by a coral reef which approaches close to the shore on the north side, but extends one mile from it on the eastern side, and $1\frac{1}{2}$ miles on the southern and western sides. The reef, which is very steep-to and marked by breakers and tide ripplings, encloses a lagoon containing several coral patches with deep water between them. The *Flying Fish* steamed round the reef, but could find no deep entrance. The island is cultivated, and on its eastern side is a considerable village, off which two small schooners were seen. On the eastern side, and within the lagoon, there is a wooded islet (Nain Kechil), 150 feet high.

Mantrau is a flat coral island covered with trees about 100 feet high, situated on a coral reef reported to extend $2\frac{1}{2}$ miles N.W. of the island. The German vessel *Mathilde* was lost on the north-west part of this reef in 1886; the depth here is 9 feet, with North cape bearing East, and the west extreme of Manado Tua S. $\frac{3}{4}$ W. There are several houses on piles on the reef.

Siladen island is low, and has a white sand beach on its eastern side.

Bunakin island is crescent-shaped, with a bay on the south-west side. The summit is on the western part, and is a round-topped hill 300 feet high, covered with brushwood. A coral reef extends about 2 miles south-west of the western point, and appears to join the fringe reef of Manado Tua.

Manado Tua is a very steep, conical, well-wooded island, apparently an old volcano. Its elevation above the sea is 2,737 feet; it is circular, and about 2 miles in diameter.

See plans, Nos. 2,194 [2,631] and 930 [2,621].

CHAPTER XI.

MOLUCCA AND GILLOLO PASSAGES TO BANDA ISLES.

Variation in 1902.

Molucca passage - $1^{\circ} 35' \text{ E.}$ | Ceram - - $2^{\circ} 5' \text{ E.}$

The MOLUCCA PASSAGE, included between the north-east coast of Celebes and Gillolo islands, is the most direct, and is the regular steam passage between the Celebes and Arafura seas. It is sometimes used by sailing vessels homeward bound from China, and after September with advantage, but it is a tedious passage to beat through as the currents set with the wind at the rate of from 16 to 24 miles a day.

When it is difficult to get to the southward in the Molucca channel, dull sailing vessels might try to do so by keeping near the west coast of Gillolo and passing through Patientie strait, between Gillolo and Bachian islands. Vessels working to the northward would find it better to keep under the coast of Celebes.

Mayo island is about 4 miles long, north and south, and rises gradually from the shore to a round-backed summit, 1,280 feet high, in lat. $1^{\circ} 19' \text{ N.}$, long. $126^{\circ} 21' \text{ E.}$ It is well wooded, with several valleys, but is not inhabited. There is said to be anchorage on both the north and south sides of the island sheltered from the monsoons.

Tifori island is 2 miles long in a south-east and north-west direction, and one mile broad. On its north-west end is a saddle peak 587 feet high; the summit is in lat. $1^{\circ} 1' \text{ N.}$, long. $126^{\circ} 8' \text{ E.}$ About one cable's length off the north side of the island is a small islet connected with the mainland by a reef enclosing a lagoon with an islet in it, on which observations for position were made by H.M.S. *Flying Fish* in 1885. Temporary anchorage was found in 22 fathoms on the edge of the reef with the summit of Tifori bearing S.S.W. $\frac{1}{4}$ W., and the peak of North island, East. The tide setting from point to point swung the ship in all directions, but not violently. On the eastern side of the island there is a bay in which, according to the statement of the Malays at Ternate, whose proas frequently take refuge in it, there is a depth of 20 to 33 fathoms, with a ridge of coral across its entrance upon which there is from one to 3 fathoms.

See chart, No. 2,575 [2,626].

Between Mayo and Tifori islands, a distance of 21 miles, there are no dangers.

Current.—During the south-east monsoon the current sets to the north, running stronger westward of the islands than to the eastward of them. During the north-east monsoon the current sets about S. by E. at the rate of $1\frac{1}{4}$ knots an hour, eastward of the islands, and is stronger there than it is to the westward of them.

GILLOLO ISLAND.—This island is called by the natives Halmabeira (said to signify in the native dialect, mainland), Gillolo being the name of that portion of it with the inhabitants of which the Dutch first had intercourse. The interior is peopled principally by tribes of a Papuan type, but the Malays have made numerous settlements on the coast. The north and south parts of the island acknowledged the authority of the Sultan of Ternate, and the middle part and the eastern peninsulas that of the Sultan of Tidore. These chiefs are Malays, and the Dutch claim jurisdiction over both.

This island, though the least important, is by far the largest of the Moluccas, and in general outline is very similar to Celebes, consisting, like it, of four long and narrow limbs, with deep intervening gulfs. It lies to the extreme north of the whole group of islands, and has a length of about 200 miles from north to south; its width across the centre is about 40 miles, beyond which the two central arms project another 50 miles to the north-east and south-east.

The northern peninsula is mainly filled up by two lofty mountain ranges, between which lies an extensive, undulating plain, well cultivated with rice, and extending almost from coast to coast. This plain, which is the most populous part of Gillolo, is known by the name of Galela, from a town on the east coast. The river Tiabu, which flows from the south through the plain, enters Galela bay on the eastern side. Of the remainder of the island there is little information.

WEST COAST of GILLOLO.—From Bisoa point, the north-west extreme of the island, the coast trends in a S.W. by S. direction for about 53 miles to Petano point, and is high and steep-to. The Salengading islands, off the north-west point, are a group of four islands surrounded by reefs; there is a channel 4 miles wide, and clear of danger, between the southern island and the coast. The islands Tago Sungi and Sidun, 6 miles north of Petano point, are connected with the coast by a reef upon which there are several islets.

Close south-westward of Petano point there are several small islets, and from the point the coast trends about 25 miles in a S. by W. direction to cape Talabu or Damar, 2 miles within which is mount Damar, with a remarkable sharp peak 3,450 feet high. A small islet lies close westward of the cape.

See charts, Nos. 943 [2,645] and 2,575 [2,626].

The native town of Gillolo is on the extremity of the point. The following remarks are by officers of the *Challenger* (vol. I., p. 604), which vessel passed north from Ternate in 1874: "The point on the coast of Gillolo opposite Hieri island was wrongly placed on the chart; it lies N.E. $\frac{3}{4}$ N., 8 miles from the peak of Hieri island. Just over this point in lat. $1^{\circ} 2\frac{1}{2}'$ N., long. $127^{\circ} 24'$ E., is a hill 1,050 feet high, and N. by E. 3 miles from this hill is a remarkable sharp peak 3,450 feet high in lat. $1^{\circ} 5'$ N., long. $127^{\circ} 25'$ E. About 8 miles north of this mountain is a flat-topped hill with four knobs on it, in lat. $1^{\circ} 13'$ N., long. $127^{\circ} 25'$ E. The coast of Gillolo did not appear to extend west of the meridian of $127^{\circ} 23'$ E."

Sidangoli point, situated about 13 miles S.E. by S. of cape Talabu is the northern limit of Dodinga bay; the Sidangoli group of islands extend from the point about 4 miles to the southward and eastward.

Passi Lamo reef, of coral, with a least depth of $2\frac{1}{2}$ fathoms over it, lies with Sidangoli point bearing N. 88° E. distant 3 miles, and the eastern point of Tidore island S. 2° E. This reef is about three-quarters of a mile long N.N.W. and S.S.E. and a quarter of a mile wide; it shows as discoloured water.

A small islet is charted as being situated N.N.W. 4 miles from Sidangoli point.

DODINGA BAY is separated from Kayu bay, on the east coast, by a narrow isthmus, on which is situated the town of Dodinga. The northern side of the bay is bordered by reefs, which dry at low water, and on which are several islets. There are also several detached reefs lying along this side of the bay which extend to the distance of about $1\frac{1}{2}$ miles from the shore; Pasir Galesa besar, the largest, is about two-thirds of a mile in extent, and the most eastern. The east shore of the bay for $3\frac{1}{2}$ miles to the southward of Dodinga town, is foul to the distance of 4 cables. Off the south side of Dodinga bay there are three detached reefs, each about half a mile in extent; they are situated respectively N.W. nearly 2 miles, North $1\frac{1}{2}$ miles, and N. $\frac{1}{4}$ E. $2\frac{1}{4}$ miles from Tanjong Oba.

Anchorage.—There appears to be well-sheltered limited anchorage off Dodinga town, in a depth of 16 fathoms, in a small bay formed by a peninsula jutting out southward and an islet standing on the eastern shore reef. Gurapien anchorage is on the southern shore of Dodinga bay, westward of Pulo Sibul, with the north-west extreme of that island bearing N.E. by E. distant $3\frac{1}{2}$ cables, and the point near Gurapien village S.E. $\frac{1}{2}$ S.; the depth is 20 fathoms. A broad shore reef extends out to the distance of 6 cables in front of the coast by Gurapien, and $1\frac{1}{2}$ cables

outside its edge there is a small detached head covered by 5 fathoms. A reef, about half a mile in extent upon which there is less than 6 feet water, lies with the north-west point of Pulo Sibn bearing E. $\frac{1}{2}$ N., distant $5\frac{3}{4}$ cables, and is a danger to vessels approaching this anchorage.

The coast south of Dodinga bay for 10 miles, as far as Akelema point, is high, steep, and clean, and can be approached to the distance of half a mile; the only known dangers off it are Pasir Rajah sand-banks. Akelema point is low. Anchorage may be had off the village of Kalam, south of the point, in a depth of 25 to 30 fathoms. Good water can be obtained from a small river to the southward of the village; deer, pigs, poultry, and firewood are procurable.

From Akelema point to the southward, as far as Mayedi (Mandi), the coast must not be closely approached, as it is bordered by rocky islets and reefs, especially near Taona, and thence to the point west of Gieta. There is anchorage in Payahe road in a depth of 8 to 15 fathoms; a cluster of rocks about 3 cables in extent lies $3\frac{1}{2}$ miles W.S.W. of Gieta, at about one mile from the northern shore, and in the approach to the anchorage. From Mayedi to Dieke point the coast is safe.

Pasir Rajah consists of two small sand-banks, dry at low water, which lie from 2 to 3 miles west of Akelema point, and about 5 miles E. $\frac{1}{2}$ N. of the north point of Mareh island. These banks, which are in the fairway from Ternate to Patientie strait, may be readily seen by their white colour during daylight, and can be avoided at night by keeping the Gillolo coast aboard.

Bank.—A small sand-bank lies $3\frac{1}{2}$ miles south of Joji islet, west of Gieta bay, and 10 miles east of the south-east point of Makyan island. Information is wanting as to the depth of water over it.

Nassau rock, 150 feet long and 30 feet broad, with 4 feet water over it (discovered by the *Nassau* in 1872), lies 10 miles S. $\frac{3}{4}$ E. of Joji islet, and 11 miles E. by N. $\frac{1}{8}$ N. from Miskien island; it is dangerous, being directly in the track of vessels making for Patientie strait from the northward. The west end of Mareh island, shut in with the east end of Motir island, clears it well to the westward. On the old chart of 1846 a bank was shown 2 miles west of Nassau rock; this is still retained marked P.D.

PATIENTIE STRAIT, which separates Bachian and Gillolo islands, is 8 miles wide at the northern entrance, between Dieke point and Batu Sombo island, but is very much obstructed further south by the Lari islands. The best channel appears to be between the south-western Lari islet, Latau, and a small conical islet north-east of it; or between Latau islet and Ruige point in Bachian. The passage between the north-eastern island, Djalo, and the Gillolo coast is very narrow and shallow.

See chart, No. 942a [2,557].

After passing through the narrows going south, the shore of either Bachian or Gillolo should be kept aboard, to avoid a steep shoal lying between Hennekes point in Bachian and Steep point in Gillolo.

Patientie strait is a useful passage for vessels sailing between Ternate and Amboina in either monsoon, and vessels have been able to beat through the strait by the help of the tides when unable to work to windward westward of Bachian island.

Dowora island (Ganeh) at the southern entrance of Patientie strait is tolerably high; on the east side are several islets and dangers; a reef projects about one cable from the south-west point. This island is reported to lie 2 miles further west than charted. The passage west of Dowora should be taken.

SOUTH POINT of GILLOLO ISLAND and ISLANDS OFF IT.—**Libobo point**, the southern point of Gillolo, is low land, with a hill upon it, and a small islet, Babi, off it; Libobo point is situated in lat. $0^{\circ} 55' S.$, long. $128^{\circ} 27' E.$ Gane road, about 13 miles west-north-westward of the point, affords confined anchorage in a depth of 13 fathoms.

The channel between Libobo point and Damar island is said in the *Moluksche Archipel* to be clear of danger, though it should not be taken during the east monsoon, except with a commanding breeze, on account of the heavy swell found in it, and then only in daylight. The currents in it are very strong.

Salo or Damar islands.—This group of islands lies to the south of cape Libobo, 4 miles distant. The northern island, Salomaki or Damar, is rather low, more especially in the middle, with hills that rise steeply on either side, giving it the appearance at a distance of being two separate islands. On its northern side is a large shallow bay, in which are many small flat coral islets, situated on a shoal bank; the northernmost islet, Pulo Katinai, lies apart. There is good anchorage westward of Pulo Katinai with its south extreme bearing S.E. $\frac{3}{4}$ S., and the north point of Salomaki W. $\frac{3}{4}$ N. There is also anchorage, in a depth of 22 fathoms, about $2\frac{1}{2}$ cables W. by N. of Pulo Katinai where a vessel can lie less affected by the easterly swell. The west coast of Damar island should not be closely approached on account of the numerous coral reefs, and dense mangroves, which grow far into the sea.

Water may be obtained from a small well on Katinai islet, mentioned above. There is no water on Damar island.

Jeronga or Hasil island is somewhat lower than the higher parts of Salomaki. The *Moluksche Archipel* states that there is a good passage between Damar and Hasil islands. It gives no information about Hasil island, nor about Five islands (which are said to lie 3 miles further

west than charted), nor the three Muidens, which lie west of Damar and Hasil. Gull rock is shown on the Dutch chart 7 miles west of the south point of Hasil.

Black rock, 13 feet high, and encircled by reef, bears East $3\frac{1}{2}$ miles from the southernmost islet on the south side of Hasil island, and S. by E. $\frac{3}{4}$ E. from the hill over Libobo point; a part of it near the east end appears like a small ship's hull. The rock should be carefully avoided during the night, and a wide berth be given to it, for the soundings in the vicinity afford no guide.

The East coast of Gillolo is described hereafter with Gillolo passage; see page 441.

ISLANDS WEST of GILLOLO. — TERNATE ISLAND, which lies about 8 miles from Sidangoli point, about the centre of the west coast of Gillolo, is of small extent being composed almost exclusively of a conical volcano 5,184 feet in height. This volcano has been in a state of constant activity for more than 200 years, during which period there have been no less than fourteen eruptions; the last occurred in 1840, and was attended by great loss of property.

The shores of the island appear to be steep-to, and with no dangers beyond a few reefs extending out from a quarter to half a mile.

The town of Ternate lies on the east coast, and is beautifully situated upon the shore at the foot of the mountain. It is the seat of the Dutch Resident, and also that of the Sultan. It was declared a free port in 1854. The population was estimated in 1881 at 9,000 inhabitants, 285 of whom were Europeans.

Position.—The coral store at Ternate (north-east corner) is in lat. $0^{\circ} 47' 24''$ N., long. $127^{\circ} 22' 51''$ E.

Anchorage.—The best anchorage in Ternate road is in a depth of 13 to 15 fathoms, at the distance of about 3 cables from the shore, with the flagstaff of fort Orange bearing from N.N.W. to N.W. by N. and the signal staff on the summit of Maitara island S.S.W. Vessels making more than a temporary stay should moor, as the bank is very steep, the holding ground bad, and the tidal streams strong.

Piers.—Two piers formerly extended from the island to the edge of the reef, which is composed of sand and coral. The northern pier is used as a landing place, and the southern (of which only a small part was standing in 1899) is the coaling pier. These piers are lightly built. At the extremity of the northernmost pier there is a signal mast, from which a red light is shown.

Supplies.—Cattle are killed only three times a week, meat being ninepence a pound. Vegetables are $2\frac{3}{4}$ d. per pound, and fresh bread 7d. per pound; fruit of all kinds is plentiful during the season. Water

See chart, No. 942a [2,577], and plan of Ternate road, 930 [2,621].

can be obtained from a conduit near the landing place; a ship must depend upon her own resources for getting it on board. The coin in circulation is the Dutch dollar of 4s. 2d., and the guilder of 1s. 8d.

Coal.—Two large coal sheds stand upon the shore abreast the coal wharf; they are capable of holding 1,000 or 1,500 tons, but only about 500 tons is usually kept in stock. The price of English coal, free on board, is 64s. 3d., and of native coal 65s. a ton.

Communication.—Vessels of the Netherlands Indian Steamship Company touch here periodically, *see* page 30.

Tides.—It is high water, full and change, at Ternate, deduced from one day's observation by the *Challenger*, at 5h. 10m.; springs rise about 4 feet. According to the *Moluksche Archipel* it is high water, full and change, at 7h., and springs range from 5 to 6 feet.

Weather.—From a register kept by the surgeon of the Dutch settlement at Ternate, extending over a period of 8 years, from 1860 to 1867 inclusive, it was deduced that the north-east monsoon blows through January, February, and March, the wind varying from north-east to north-west. After a month of variable winds, the south-west monsoon commences in May and ends in October, its direction being from south-east to south-west. During November and December the winds are again variable.

Rain fell on 216 days of each year, or 18 days per month; the average fall during the north-east monsoon being rather less than during the south-west monsoon. *See* p. 574.

The mean temperature for each of the above 8 years was 80·7°.

On comparing the records of the weather at Ternate with those at Amboina and stations eastward, it would appear that, during the periods of their greatest strength, the north-east monsoon passing through the Molucca passage turns eastward and becomes the north-west monsoon in the Banda and Arafura seas; and that the south-east monsoon blowing through the Arafura and Banda seas, bends into the Molucca passage, and joins the south-west monsoon in the Pacific.

Hieri island, lying to the northward of Ternate, is irregular in shape, about 1½ miles in diameter, and rises to a conical peak, 2,200 feet high. There is a rock off the north point of Hieri, and to the north-west of the island a small islet, both close to the shore.

Ternate channel, between Ternate and Maitara, should not be taken by a sailing vessel except with a commanding breeze, on account of the eddies. The flood-stream in it, coming from the north-eastward, forms numerous tide-rips and eddies, which give the appearance of broken water over a sunken reef. If unable to make way in it, a vessel might

See plan, No. 930 [2,621].

anchor on the south shore of Ternate in a depth of 13 fathoms, shells, with Maitara peak bearing S. $\frac{1}{2}$ E.; there is no anchorage off Maitara island.

Maitara island is about 600 feet high, crater-topped, and well-cultivated; it is surrounded by a reef which extends out about 4 cables from the west side, and for one cable along the whole of the north coast. There is a signal station on the summit of Maitara island.

Tidore is an island about the same size as Ternate, from which it is separated by a passage under 2 miles in width. It is of volcanic formation, the centre peak rising from a mass of low rugged hills to a height of 5,900 feet. There has been no eruption within the memory of man. The soil is remarkably fertile, and the island is well cultivated, the natives being more industrious and inclined to agriculture than those of Ternate. The population in 1881 amounted to 8,157.

The chief town is Saosio, on the east coast. In front of the town there is a reef of rocks and stones, to some extent natural and partly artificial. There is anchorage off the town in a depth of 30 fathoms, sand. A Dutch *Controlleur* is established at Saosio.

Mareh island lies 2 miles south of Tidore; there is anchorage near its south point, sheltered from the north-east. The island received the name of Potbakkers from the Dutch, on account of the potter's earth found on the north-east point, near which is a hill 617 feet high. The island has two peaked hills on it. The chart gives an elevation of 1,160 feet for the island.

Motir island, 5 miles south of Mareh, is another volcanic cone, 2,800 feet high; it is stated in the *Moluksche Archipel* to be steep on all sides except the south-east, from which a small reef projects. The east coast is covered with plantations and gardens, and with forests to the summits of the mountains. A coral reef extends three-quarters of a mile from the north-west point of the island.

Makyan island, 4 miles south of Motir, was in the year 1861 devastated by a volcanic eruption, and the population destroyed or obliged to leave the island. Notwithstanding this, Dr. Bernstein in his last visits in 1862-61, found even the ground which had been most injured again covered by luxuriant vegetation. There is anchorage off Powati on the east side in a depth of 30 fathoms, at a distance of about one cable from the shore, with the highest peak of the island bearing W.S.W.

Kayoa is an island nearly 10 miles in length, lying 9 miles south of Makyan; a range of hills runs almost through its entire length which reach an elevation of 1256 feet. There is anchorage on the east side of the island, southward of the north-east point, off the village of Gunrippingi.

Miskien islet lies close northward of Kayoa.

See chart, No. 942a [2,577]; and plan of Powati anchorage, No. 912 [2,624].

Lolun island, S.S.W. of Kayoa, is shown on the chart to be almost joined to that island by a reef, upon which there are several small islands and islets.

Guarichi islands, south-west of Makyan, are a group of five small wooded islets of moderate height, and several bare rocks. The westernmost, Leli, is shown on the Dutch chart of 1878 as lying in lat. $0^{\circ} 8' N.$ and long. $127^{\circ} 4' E.$ By daylight they are not dangerous, as most of them are visible; at night it is well to give them a wide berth, as the set of the currents in their vicinity is uncertain.

Wolf rock is nearly level with the surface, the sea breaking over it, when it becomes visible in the hollow of the wave. It was examined in 1846 by Lieut. de Brauw, who obtained a depth of 16 fathoms at the distance of $1\frac{1}{2}$ cables southward of it, and 13 fathoms at one cable to the northward; no other shoal was found in the vicinity. From the rock the centre of Ternate bears N.E. by N., the centre of Makyan E. by N. $\frac{1}{2} N.$, and the most northerly of the Guarichi islets (Gafi) E. $\frac{3}{4} S.$

Tameti island, of the Dutch chart of 1878, is called Little Tawali in the *Molukse Archipel*; it lies about 8 miles westward of Lolun island and has a number of small islets off its northern end.

Lata Lata islands.—Captain Forrest, in 1775, anchored in Malaleo cove, on the north-west side of Tapi island, in 4 fathoms, close to the shore. The depth in the middle of the cove is 12 fathoms; the eastern entrance point is bordered by a reef. The strait between Tapi and Lata Lata is only 40 yards wide in places.

The following remarks are taken from the *Challenger* Report (Vol. II., p. 593). "The islands of Mandioli, Sao, Tawali, and Tapi and the summit of mount Laboa, on Bachian island, are correct relatively to each other on the Admiralty chart of the Eastern Archipelago, eastern portion, but they all require to be shifted S. $75^{\circ} E.$ (true) 3 miles to make them agree with the positions obtained by the *Challenger* (depending on the longitude of Amboina). Mount Laboa is a remarkable flat-topped mountain, 7,150 feet high, in lat. $0^{\circ} 44' 30'' S.$, long. $127^{\circ} 31' 45'' E.$ Great Tawali island is high and flat-topped, but has a peak rising above the surrounding hills, 2,650 feet high, in lat. $0^{\circ} 20' S.$, long. $127^{\circ} 10' E.$ The highest peak of Tapi, 1,300 feet above the level of the sea, is in lat. $0^{\circ} 15' S.$, long. $127^{\circ} 4' E.$ Off the south and west extremities of Tapi are two small islets, about 200 feet high, and 3 miles to the northward of its north point, in lat. $0^{\circ} 11' S.$, long. $127^{\circ} 1' E.$, are three small rocks 130 feet high, and close together."

BACHIAN ISLAND, the largest and most southern of the true Moluccas, is 46 miles long north-west and south-east with a mean width of about 20 miles. The island is generally mountainous, especially towards

the north and south; the central isthmus, which connects these two portions, being of a much lower elevation. The highest peak is that of Laboa. There are no volcanoes, but there are sulphurous springs of a high temperature, and the island is subject to occasional shocks of earthquake. The interior is uninhabited, but the coast districts are peopled by Ternate and Celebes Malays, and by wandering tribes of Gillolo aborigines. In 1881 the population of Bachian, Ombi, and the adjacent islands was given as 25,000. For rainfall, *see* p. 574.

Only a small part of the town of Bachian is under the direct authority of the Dutch *Controleur*, the remainder of the island, together with the islands off the west coast, being under the jurisdiction of the native sultan.

Bachian town, the seat of the *Controleur* and residence of the Sultan, is situated at the head of a deep and wide bay, about the middle of the west coast. The trade is principally in the hands of the *Bachian Trading Company*, which has been established some years, and has large plantations of coffee, cacao, nutmegs, and tobacco; gum copal and dammar, of the value of £6,700, was exported by the company in 1885. Vessels of the N.T.S.S. Co. call here once a month; *see* page 30.

The anchorage is off the east end of the town, about $4\frac{1}{2}$ cables S.S.W. of the church in a depth of 10 fathoms, good holding ground; with easterly winds there is a considerable swell. The wreck of a large three-masted ship lies in the roadstead, with her bulwarks and bowsprit above water, and the three lower masts still upright (1900).

Coal.—Four miles southward of the town of Bachian there is an inlet which the Dutch company have utilised as a coaling station, and where the *Marchesa* in 1884 obtained good coal from alongside the pier. The station is named Padang or Pernambuan.

The coal mines lie up the valley of a small but rapid stream; the coal is said to vary in quality; when tried on board the Dutch man-of-war *Etna* it gave good results.

Great Tawali island, lying close westward of the north end of Bachian, is about 17 miles long north and south, and 13 miles wide; it is high and flat-topped, its most elevated peak being 2,650 feet above the sea. On the west side of this island there is a small bay, Bissori (possibly the Imbu Imbu of the Dutch chart), with a small island on the north side, and a reef projecting from the south point. A depth of 16 to 20 fathoms will be found with the little island bearing North, and good anchorage within the bay in 12 fathoms. Water can be obtained here. The passage between Tawali and Lata Lata is said to be free from danger. The brig *Nautilus* worked through from south to north in 1839. There are several islands off the south-east part of Tawali, between which and Bachian island lies the narrow Herberg strait.

See chart, No. 942a [2,577], and plan of Bachian road 912 [2,624].

Sambakki and Herberg straits.—Sambakki strait is only $1\frac{1}{2}$ cables wide between the islets and reefs at its northern entrance; within, it widens out to a breadth of about $2\frac{1}{2}$ miles, and again gradually narrowing becomes quite contracted at Herberg strait, the southern approach. The western shore is fringed by reef, as is also the eastern side northward of Andari. About 4 miles within the northern entrance, Pearl bank projects out to the distance of about one mile from Great Tawali island; its outer edge is marked by a perch beacon surmounted with a cross. Andari point, and the Bachian coast for about 2 miles to the southward of it, is clean-to; about one mile further south on this side is Passiundang bank, dry at low water, and with a little clump of young bakau-trees on its outer side; this bank should be passed at a distance of fully a cable westward.

Herberg strait, formed between the Bachian shore and the group of islands extending about 5 miles south-eastward from the southern part of Great Tawali, is very narrow, less than half a cable; the islet on its west side, and the rock covered with vegetation on the east side are steep-to. This channel offers no difficulty to steam vessels of about 800 tons, and can be used with advantage by them when bound northward in the north-west monsoon, which blows strong from N.N.W. outside Tawali island. The passage through the narrows is more easily made when taken against the current.

Mandioli island, 14 miles long, 7 miles wide (except at the narrower northern end), and about 1,000 feet high, lies about 8 miles westward of Bachian, and there is a chain of islands and islets stretching across between them. The islets Babi and Sao lie respectively about 3 and 5 miles W.N.W. from the northern end of Mandioli; several reefs lie southward and eastward of the islets. On the east side of Babi there is anchorage in a depth of 13 fathoms.

Gamyaka reef.—The chart shows a narrow reef about 12 miles in length, as being situated about 5 miles westward of Mandioli, with a bank named Gamyaka on the middle of it.

Bachian strait, between Mandioli island and the south-west end of Bachian, is about 7 miles wide at its southern entrance. The northern approach between Obit island and the coast northward of Bachian bay is very narrow; the channel lies towards the islets which stand near the Bachian shore. The currents in the strait are said to be very strong and irregular, especially in the northern part.

Current.—A constant current to the northward was experienced by H.M.S. *Flying Fish* in September 1885, during a search for the alleged Balia reef reported to exist about 25 miles S.W. of Mandioli island, the wind being light from the southward all the time. In November 1891,

H.M.S. *Penguin* found the current on the west coast of Gillolo setting S. by E. at the rate of $1\frac{1}{2}$ miles an hour. The *Moluksche Archipel* states that there is always a current to the southward on this coast during the north-west monsoon.

Severe tide-rips are experienced extending over a space of about 30 miles to the west and north-west of the Ombi islands.

OMBI MAJOR or **OMBIRA**, lies on the north side of Pitt passage. It is about 48 miles long, east and west, and 20 miles wide; and is lofty, the highest part being about 5,000 feet high. Over the north-west point of the island is a remarkable bluff, with a knob-like summit, probably a clump of trees, higher than the surrounding forest. Five miles southward of this bluff is a projecting point which looks like an island. From the western point a reef runs out. Ombi Major is but scantily populated; the chief produce is sago. It is surrounded by several smaller islands, of which Gomono, on the south side, is the most conspicuous from Pitt passage; this last is 850 feet high, round backed, and its centre is in lat. $1^{\circ} 51' S.$, long. $127^{\circ} 36' E.$

Sophia reef, lies $2\frac{1}{2}$ miles N.W. of the north-west point of Gomono island, and about 3 miles from the south coast of Ombi Major.

Ombi Latu is 6 miles in diameter, and attains an elevation of about 2,400 feet; upon it are three or four sharp, well defined peaks, of nearly equal altitude, the highest point being in lat. $1^{\circ} 25' S.$, long. $127^{\circ} 18' E.$ Its centre is 5 miles W.N.W. of Pala point, the north-west extreme of Ombi Major. The *Marchesa* anchored in a little bay on the north-east side of the island in a depth of 4 fathoms, well protected from all winds except those from the eastward. The small island of Beilan Beilan lies off the north-east end of Ombi Latu.

Tapat island, lying 12 miles off the north-west coast of Ombi Major, is about 4 miles in extent, and rises in a single round-backed hill to the height of 1,000 feet.

Bisa island, situated close eastward of Tapat is 12 miles long, east and west, and narrow; the western end is elevated and the eastern part is low. Santare islet lies off the south-west point. Between Bisa and the coast of Ombi Major there are several reefs.

Courier rock is about three-quarters of a mile in length and very narrow, with one fathom water over it. It lies with the summit of Tapat island over the north point of Bisa island N. $82^{\circ} W.$; a high mountain in Ombi Major S. $66^{\circ} W.$; and the north-east point of Ombi Major S. $45^{\circ} E.$

Long island, westward of the north-east point of Ombi Major, is nearly 5 miles in length N.W. by W. and S.E. by E., is well wooded and of moderate height, stretching with a remarkably even slope to the point

that forms its east extremity. The channel inside it is very narrow, and subject to calms, owing to the adjacent high land, and is therefore not recommended for ships.

The SULA ISLANDS are four islands of considerable size, lying eastward of the central peninsula of Celebes, to which they belong both geographically and zoologically, though under the government of the sultan of Ternate. The three northern islands form a chain extending east and west about 135 miles, and are high, bold islands, thinly populated.

Taliabu, the westernmost and largest, is very little known. Greyhound strait, between the west coast of Taliabu and the chain of islands and reefs which lie off the eastern coast of Celebes, is out of the scope of this work.

Mangola, the middle island, is generally high, especially at the north-west end, where it is lofty and rugged; a mountain near the north coast, at about 20 miles from the east end of Mangola, has an elevation of 4,726 feet. There are three native villages on the island. A small island, Orab island, surrounded by reefs, lies near the north-west point of Mangola, in the approach to Sapalalu strait.

Sapalalu strait, between Taliabu and Mangola, varies in width from half a mile to one mile, and is apparently clear of danger. Captain W. Ellis passed through the strait in the s.s. *Airlie* on two occasions in 1890 and 1891, drawing 22 feet, and reported that he obtained no soundings at the depth of 10 fathoms. The banks are thickly wooded with here and there a small piece of ground cleared by the natives.

A heavy tide rip was observed at the southern entrance, where the tidal stream runs at the rate of 4 to 4½ knots an hour.

Lisamatula, the easternmost island, is uninhabited; the sides are steep and thickly wooded; the top presents an even rounded appearance, the highest part being 1,164 feet high. The island is separated from Mangola by a narrow channel in which there are several islets. At the eastern extremity there is an inlet penetrating about a mile, divided into two arms by a low tongue of sand covered by bushes and bordered by reef to the distance of a cable; the depth of water at the edge of the reef falls rapidly to 35 fathoms. The *Flying Fish* anchored off this reef while fixing the position of the eastern point of the island, but no safe anchorage was found, and by the appearance of the shore a heavy sea must sometimes set in.

The eastern point of Lisamatula consists of Tertiary fossiliferous limestone, somewhat underworn by the action of the sea; it is surmounted by a hill 340 feet high, and was determined to be in lat. 1° 48½' S., long. 126° 28¼' E. There are no dangers off it; the bottom slopes gradually to a depth of 40 fathoms at the distance of one mile, and 135 fathoms at 2 miles. A very strong tide-race makes off the point, the

flood tide setting to the south, the ebb to the north. A small saddle-topped islet, about 250 feet high, lies S.S.W. of the point. On the north-east side of the island, the white cliffs laid bare by land-slips are conspicuous to a considerable distance.

Sula Besi, the southernmost island, is of considerable height, being visible at a distance of 40 miles, and presenting a level appearance when thus seen. The island is well inhabited and cultivated, producing wax, honey, and rice. There is a village near the south-east end named *Ipa*, where the chief resides. On the north-east coast there is a small creek called *Sannana bay*, about $2\frac{1}{2}$ cables wide in the middle, where there is good anchorage in a depth of 10 fathoms. The entrance is nearly closed by reefs from both sides, which leave only a narrow passage half a cable wide; the little fort at the head of the bay bearing W. by N. $\frac{1}{2}$ N. will lead through this passage.

Channel between Sula Besi and Mangola.—The northern part of Sula Besi is bordered by a reef, extending $2\frac{1}{2}$ miles in an easterly direction, and more than half-way across the channel about 3 miles wide between it and Mangola, at which distance the depth is $1\frac{1}{2}$ fathoms. Vessels using this channel should keep along the Mangola shore, which is bold, and affords anchorage off it in a depth of 30 fathoms. Currents run at the rate of 3 to 4 knots in the channel, and the eddy winds from the high land make it inadvisable for a sailing vessel to take this passage.

GILLOLO PASSAGE.—The Gillolo passage formed between the islands Gillolo and Waigiu is separated into two channels by Gebi island which lies across nearly in the middle. The western channel between Gillolo and Gebi is that generally known by the name of Gillolo passage, and is preferable to the eastern passage. The channels between the islands leading from Pitt passage into Gillolo passage are all held to be safe. That between Gasé and Kikik, being wide, is generally preferred in the north-west monsoon; for the other wide channel between Pisang island and the Bu islands is at that season too far to leeward, but it may be adopted by ships coming from the northward during the south-east monsoon.

Caution.—It is reported that the longitudes of the islands and points east and west of Gillolo passage are charted from 4 to 6 miles too far east, caution, therefore, is necessary.

Morti island, lying 13 miles off the north-east point of Gillolo (which is in lat. $2^{\circ} 12' N.$, long. $128^{\circ} 4' E.$), is 43 miles long, north and south, and 16 to 18 miles wide according to the Dutch chart. It slopes down from a high table land to a point which forms the north cape. The northern coast is skirted by a reef extending one or two miles out, having

See plan, No. 930 [2,621], and charts, Nos. 942a [2,557] and 781 [3,256].

no soundings close-to, with some small islands adjoining. Many islets lie off the south-west coast of Morti.

Rau island lies off the western side of Morti, separated from it by a small strait; off the north and south-east sides of the island there are islets and rocks. Between the north-east part of Rau and Morti there is said to be anchorage; it is reported that fresh water and game are obtainable, but the island is uninhabited, and only rarely visited from Gillolo.

EAST COAST of GILLOLO.—Galela bay.—Galela village stands at the head of this bay about 3 miles south of the mouth of the river Tinbu; the land at the head of the bay is low but behind the village are two hills joined by a little ridge; the higher of the two, mount Tarakan, has an elevation of 918 feet. The Dutch government formerly had a settlement here. There is anchorage in a depth of 22 fathoms very close to the shore with the point east of the anchorage bearing about East, and the point north of it about N. $\frac{1}{2}$ E.; it is necessary to lay out a hawser to the shore.

Loari point, the south-east point of Galela bay, is a sloping spur of mount Mamuya, an old volcano 2,985 feet high, wooded to the summit; the point is bordered by reef.

Tabello islands off Loari point are flat, and skirted with mangroves and cocoanut trees. In the interior there are thickly populated villages, the inhabitants of which live by fishing and cultivating rice. The largest and most populous island is Tolonuo.

The coast is flat, as far south as Mauvea point (not named on chart) off which there is anchorage protected by the little islands Miti and Magalisso. From here to Batikara point the coast is rocky and unapproachable; inland there are steep hills about 200 feet high.

Kayu bay, which separates the north-eastern from the northern peninsula, does not appear to have been much explored. The town of Kayu lies on the north coast, and the river Kayu enters on the same side. The chart shows anchorage in a depth of from 5 to 10 fathoms off the town of Kayu. Batikara point, the western entrance point, has an island, Bali, off it. Lolobato the eastern entrance point, is bordered by reef which projects to a distance of 2 miles north-west from the point.

Cape Salawai, the northern point of the north-east peninsula, has a reef off it, projecting 2 miles to seaward. The coast between Lolobato point and cape Salawai appears to be safe with deep soundings off it. Dabo Baboli point, near cape Salawai, is in lat. $1^{\circ} 32' N.$, long. $128^{\circ} 44' E.$

BULI or WOSSA BAY, lying between the north-eastern and south-eastern peninsulas of Gillolo, has numerous islets and rocks scattered in it. Wayameli point, the northern point of the bay, some 25 miles from

See charts, Nos. 943 [2,645], 942a [2,577], and 942b [2,558].

cape Salawai, has a reef off it. Gareel shoal, the position of which is doubtful, is shown on the chart on the north side of the bay, 13 miles S. by W. of Wayameli point. A sand bank extending north-west and south-east about one mile, the north part of which uncovers at low water, lies with Buli point bearing S. 87° W., distant about 5 miles, and Para Para islet S. 82° E.; a depth of 42 fathoms, mud, was obtained at the distance of one cable from the bank. Several other banks are shown on the chart as lying off the northern and western shores to a distance of 5 miles from land.

Maba road in the south-west part of the bay offers anchorage in a depth of 9 fathoms, mud, N.E. by N. of the flagstaff of the village, and north of the islet Maba, which is united to the coast by a reef. Good water can be obtained here.

Bitjoli or Wossa road on the south side of Wossa bay offers good anchorage in either monsoon. The village of Wossa, which stands on the shore about 10 miles west of Sandy point, the southern point of Wossa bay, was formerly occupied by a small Dutch garrison, now withdrawn. There are several islands off this part of the coast; of these, England island close to Sandy point is the largest, and the only one inhabited. Para Para, 13 miles northward of Wossa, is the northernmost; these islands are all surrounded by steep reefs. The channel between England island and Otto island to the north-west is safe, with a depth in it of 17 to 23 fathoms. The channel between Otto island and Worra island, which lies 4 miles west, is reported to be safe.

The anchorage is between Worra island and the village of Wossa on the main land in a depth of 14 fathoms; care must be taken not to bring the west point of Worra to bear eastward of N.N.E.; the Dutch chart of 1878 shows a large bank to the westward of this position. During the west monsoon it is better to lie closer under Worra island, which can be approached within 3 cables on the south side.

The Shanpi islands are said to consist of four islands and several islets surrounded by a reef, lying about 7 miles from the east coast of Gillolo near Sandy point. They extend about 8 miles north-west and south east; the northern one is the highest, the others are mostly level and not very high. The channel between the islands and the coast is safe.

A shoal of sand and stones covered by 10 fathoms water, is situated with the easternmost of the Shanpi islands bearing S. $\frac{1}{4}$ W., distant about 10 miles, and Catherine island E. $\frac{1}{4}$ N. A shoal, marked E.D., is charted $\frac{1}{2}$ miles, N.N.W. $\frac{1}{4}$ W. of this position.

Cape Tabo, the eastern extremity of Gillolo, has a gradual slope, ending in a bluff to seaward; and when bearing N.W. by N. some white

cliffs are seen near it. The land hereabout is high, and over the point a hill rises, like a quoin with its thick end to the westward. Pulo Moar is low, flat, and woody, stretching about $1\frac{1}{2}$ miles out from cape Tabo, and surrounded by rocks and breakers; there is a narrow passage between the island and the cape. Close eastward of Pulo Moar there is a small islet in lat. $0^{\circ} 8' N.$, long. $128^{\circ} 57' E.$, which forms the western boundary of the passage between it and Gebi. The eastern coast of Gillolo is well inhabited in many places, with small villages fronting the sea adjacent to cape Tabo.

Anchorage.—Gimia road lies 15 miles north-west of cape Tabo, off which there is anchorage at the distance of $2\frac{1}{2}$ cables from the shore. Off Gam Sungi, 10 miles westward of the cape on the south side of the peninsula, there is anchorage in a depth of 20 fathoms, with the flagstaff bearing N. by E., distant $3\frac{1}{2}$ cables; a coral shoal, covered by 2 fathoms water, lies near the anchorage, with the east extreme of the bay bearing E. by N. $\frac{3}{4} N.$, and the flagstaff N.N.W. $\frac{3}{4} W.$, distant $4\frac{1}{2}$ cables.

WEDA BAY, the great bay between the south-eastern and southern peninsulas of Gillolo, takes its name from a town on its western side near the head. Moar island lies off cape Tabo, the extreme of the south-eastern peninsula. The east coast of the southern peninsula is reported by Dr. Bernstein to be mountainous.

A coral reef, $3\frac{1}{2}$ cables long in a north-west and south-east direction, and upwards of a cable wide, with a depth of 3 fathoms on it, lies with the north extreme of Moar island bearing East, distant 8 miles; from the reef this end of Moar island is in line with the south extreme of the coast between. Several detached rocks and reefs lie off the northern coast of Weda bay, and in places at the distance of $2\frac{1}{2}$ miles from the shore.

Weda road.—There is anchorage in Weda road, about one cable outside the 5-fathoms line, in a depth of from 7 to 20 fathoms (the bottom shelving very quickly), with the flagstaff at Weda town bearing N.W. $\frac{1}{2} W.$, distant 4 cables, and the south-east extreme of Uga Yef N.E. $\frac{3}{4} N.$ The shore reef extends out about 3 cables in front of the anchorage, and to the distance of 7 and $5\frac{1}{2}$ cables respectively close to the northward and southward of the above position. Seamew reef is a danger lying with the south-east extreme of Uga Yef bearing about N.W. by W. distant 5 cables.

In the approach to Weda road, and off the coast for a distance of about 12 miles to the southward of it, there are many reefs and shoals which are a danger to navigation, extending out 4 to 7 miles from the shore.

Weda islands are low and wooded, and form two compact groups. The outer island of the eastern group bears about N.E. by N. from the south point of Gillolo, distant about 20 miles; Farewell island stands by

itself, $2\frac{1}{2}$ miles southward of this group. The western smaller group lies W.N.W. of the eastern group. They seem to be safe to approach though very steep-to. The *Marchesa* tried for anchorage among them but found none.

Veldman rock, 6 miles northward of the eastern group, is of small extent with deep water close to it. The least depth of water found on it was 2 fathoms, but there might be less; from near the shallow part the easternmost Weda island bears S.E. by S., and the westernmost W. by S. $\frac{1}{2}$ S.

The south point of Gillolo, and the islands and reefs off it have already been described; see page 431.

DANGERS NORTH of GILLOLO PASSAGE. — **Canton packet shoal**, lying north-eastward of the Shanpi islands, is described as being of white sand and black rock, with the sea breaking in one place on what appeared to be a rock near the surface. From a position in a depth of 9 fathoms near this shoal, the south-east point of Gillolo (probably the hill over the point, distant 26 miles), bore S. by W., and Catherine island N.E. by E. $\frac{1}{2}$ E.

Recovery rock is described as a round islet with shrubs on it, lying 7 miles S.W. by W. from the Catherine islands.

Catherine islands are three small low islands near each other, bearing N. by E. $\frac{1}{4}$ E. about 33 miles from Moar island. They are described as being about $1\frac{1}{2}$ miles long W. by N. and E. by S., low, and steep on the south side, except near the east end where there is a small sandy cove.

Aurora bank, with a depth over it of $1\frac{1}{2}$ fathoms, is charted as lying E. $\frac{3}{4}$ N. 17 miles from the easternmost of the Catherine islands, in lat. $0^{\circ} 42' N.$, long. $129^{\circ} 23' E.$ It has been reported by a whaler that there is only 5 feet upon the bank in some parts.

Winchester bank was reported by Captain Winchester of the *Coral Nymph*, who in December 1865 saw rocks under the ship, and sounded in 12 fathoms; he was of opinion, however, that the depth was not more than 5 or 6 fathoms when the rocks were first seen. The position is shown on the chart in lat. $0^{\circ} 44' N.$, long. $129^{\circ} 38' E.$

Ormsby bank was first discovered by Captain Ormsby, who struck 15 fathoms with Wiang island bearing S. $\frac{1}{2}$ E., and placed the north edge of the shoal in lat. $0^{\circ} 36' N.$ Subsequently the captain of the *Chusan* obtained the depth of 7 fathoms with Siang island bearing S.S.W. 17 miles; the bank to the north of the ship at the same time appeared to have much less water, and was very smooth. The chart shows 5 fathoms in lat. $0^{\circ} 44' N.$, long. $130^{\circ} 2' E.$, and a rock with less than 6 feet water 8 miles S.S.W. of that position.

See charts, Nos. 942a [2,557] and 942b [2,558].

In 1878 the British barque *Fire Queen* obtained depths of 20 to 27 fathoms from a distance of 10 miles south-west of Ormsby bank, in a northerly direction, to abreast its north-western edge.

EAST SIDE of GILLOLO PASSAGE.—Gebi island, which lies at the middle of the northern part of the passage, is about 24 miles long north-west and south-east, and in general is less than 4 miles wide; it is traversed by a range of hills, the highest, on the eastern side, attaining an elevation of about 1,200 feet; the formation is probably sandstone, not volcanic. The northernmost part is rather low, but the south-eastern is high and terminates in a bluff point. The north coast is unapproachable in boats; the western part is stony and without water and therefore uninhabited. There is a bay on the south coast with good anchorage. Authorities disagree about there being anchorage off Kotiapi, a village on the east side of Gebi.

Fow island, off the middle of the south-west side of Gebi, is separated from it by a channel about a quarter of a mile wide, which forms a safe harbour with depths of 7 to 12 fathoms. It may be entered from either side of Fow island by keeping close to that island in order to avoid the shoals that lie in the middle of the passages on either side; the widest and best channel is between Fow and the two shoals to the eastward. There is also anchorage in the bay both northward and eastward of these two shoals in 15 to 20 fathoms very near the Gebi shore, about 2 miles from Kotiapi the principal village on the north-east side.

A creek penetrates Fow island to a distance of one mile from the northern side; at the time of its exploration in 1772 it was a third of a cable wide at the entrance and 4 fathoms deep, widening within to $1\frac{1}{2}$ cables with a depth of 10 to 16 fathoms; we have no late information concerning this creek.

Water may be obtained from a rivulet on the Gebi shore opposite the north point of Fow island, and also from a creek east of the south point of Fow.

The U.S.S. *Alert* reported in 1877 that in the channel between Gebi and Fow islands, depths of 7 to 12 fathoms were obtained where formerly 10 to 16 fathoms existed; no good landing place for ships' boats could be found in this channel, neither could water be obtained. The shoals on the east side of Fow island are extensive.

Iyoi island, 5 miles from the north-east shore of Gebi island is low. The islet Utu, close to the north end of Iyoi is also low.

Siang island, the outermost island of the north entrance to Gillolo passage and about 27 miles north-east of Iyoi, is a low flat island extending about $5\frac{1}{2}$ miles N.N.E. and S.S.W.; and nearly 5 miles east and west. There are depths of 10 to 20 fathoms at a distance of 2 or 3

miles from the west side of the island, decreasing towards the shore. A reef projects three-quarters of a mile from the north-eastern point. Eye island, off the north end of Siang, is small and low, with the depth of 7 fathoms at the distance of a mile to the westward; breakers have been reported to extend $1\frac{1}{2}$ miles northward of Eye island. Hunter bank, having 10 fathoms over it, is said to lie 5 miles to the eastward of Siang.

Wiang island, about 8 miles south-east of Siang, is the north-westernmost of a group of islands, some of which are of considerable height, extending off the north-west end of Waigiu. The two line islets are the easternmost, and Ruib, the largest and highest, the southernmost. Ruib is surrounded by islets and rocks which contract the passage between it and Waigiu, called Bougainville strait.

The channels among these islands are probably safe in many parts, but require caution, as the French corvette *Uraïne* found a coral bank of $5\frac{1}{4}$ fathoms 5 miles N.W. by N. from the north end of Ruib.

Waigiu, Jef-fam (Tameai), **Battanta**, and **Salwatti** islands will be described in the next chapter.

Gag island, lying 24 miles E.S.E. from the southern end of Gebi, is about 8 miles long N.N.E. and S.S.W. and moderately elevated in uneven hummocks; the north-west coast is steep and barren, the north coast is not so steep, and wooded; cultivation is confined to the valleys. The chart shows the south-east coast to be bordered by a considerable reef. There is a sand-bank off this coast covered with 3 fathoms water and about a cable in extent. The Netherlands steamer *Batavia* anchored close to this sand-bank with the south point of Gag island bearing West, and the east point N. by E.

The channel between Gebi and Gag islands is sometimes taken by ships going outward, and may probably be advantageous to those coming towards Pitt passage during the south-east monsoon.

Jef-doif islands are a line of islands, about 13 miles in length E. by S. and W. by N., of which there is no account; they are placed on the Dutch chart 22 miles to the southward of Gag island, and are named respectively from the westward Vlaming, Schoterug, Klaarbeek, and Kommerrust. The *Vettor Pisani* in 1872 found a bank of 7 fathoms about one-third of a mile long, at 5 miles S.S.W. of Vlaming.

Bu islands, 57 miles S. by W. of Gebi island, form a group of seven small low islands and several little islets, connected together by a reef, which surrounds the whole group. The islands are inhabited. Coral reefs extend along the south coast of them to a distance of $1\frac{1}{2}$ to 2 miles, apparently with deep water between the occasional narrow breaks in the reef, which appear to be deep, but have not yet been examined. A reef,

having a depth of one to 5 fathoms over it, extends $1\frac{1}{2}$ miles in a south-easterly direction from the south-east point of Esplee, the eastern island; near the extremity of this reef, where there is a depth of 12 to 14 fathoms, there is a strong tide-rip. A reef is shown on the chart $3\frac{1}{2}$ miles south of the western Bu island, with no bottom at the depth of 150 fathoms at its southern edge, but there is no information as to whether this reef is connected with the island reef.

There is anchorage on the eastern side of Esplee island, in a depth of 10 to 13 fathoms, at the distance of 4 to 8 cables from the shore.

Grosvenor and Carmelita banks.—The Grosvenor bank is placed on the chart 9 miles S. by E. of Esplee (the easternmost Bu island), but its position is somewhat doubtful. The *Castlereagh* struck in 1817 on a reef bearing South from Esplee, and in 1826 the *Dona Carmelita* passed on the northern side of a bank which she placed S. 20° W. 9 miles from the southernmost of the Bu islands; on the north side of the bank there appeared to be a depth of only 3 to 6 feet of water. It is probable that the above dangers are one and the same shoal.

Kofiau island is about 17 miles long east and west, and 6 miles in general breadth. It has two remarkable hills on the west part, which can be seen at a great distance; the one of semi-circular form like a bee-hive, the other of oblong shape, the rest of the island being entirely flat. Laat bay, at the eastern part of the south side is 4 cables long north and south, $2\frac{1}{2}$ cables wide, and has a depth of 17 to 22 fathoms in the middle. The group of islands off the south-west part of Kofiau island is sometimes called Tatas.

Caution.—The channel between Esplee island and Kofiau is 15 miles wide; between the Grosvenor bank and Essel island, south-west of Kofiau the width is 10 miles. Vessels using this passage should give Esplee island a berth of at least 3 miles, and as the neighbourhood of these islands has been only partially surveyed, great care is necessary when navigating this part of the eastern archipelago.

DANGERS in the SOUTH PART of GILLOLO PASSAGE.—**Nabob shoal.**—In 1845 the British ship *Nabob* passed over a coral reef $1\frac{1}{2}$ miles long east and west, and 2 cables broad; the Bu islands bearing E. by S. and Pisang island South. The least water obtained was $3\frac{1}{2}$ fathoms.

Archvar shoal, composed of coral, extends in an east and west direction nearly $1\frac{1}{4}$ miles, with a breadth of about one cable, and has an estimated depth of $2\frac{1}{2}$ fathoms; it lies with the Western Bu island bearing E. by N., and Pisang island South. Position, lat. $1^{\circ} 12' S.$, long. $128^{\circ} 53\frac{1}{2}' E.$

See chart, No. 942b [2,558], and plan, No. 912 [2,624].

Pisang island attains a height of 700 feet, and shows two peaks which can be distinguished at a distance of 27 miles. It rises abruptly from the sea without any beach; a small islet lies a quarter of a mile E.S.E. of it.

A bank, about 2 miles in diameter, and marked *P.D.* is charted as lying 10 miles N.E. by E. $\frac{1}{2}$ E. from Pisang, or nearly midway between it and the western extreme of the Bu islands.

Kikik island, in lat. $1^{\circ} 30' S.$, long. $128^{\circ} 37' E.$, is high. Lawin island, about 5 miles eastward of Kikik, is also high, and has an islet off both its eastern and western sides; a coral reef extends one mile south-east from the islet on the east side of Lawin. Button island, is a small islet lying $2\frac{1}{2}$ miles N.E. by N. of Kikik.

Bank.—There is a bank northward of Button islet the extent of which, and depth of water over it are unknown. In 1868 the American vessel *Brewster* anchored on this bank in a depth of 14 fathoms, with Button islet bearing S. by E. distant $3\frac{1}{2}$ to 4 miles; at the same time another vessel anchored 3 miles eastward of the *Brewster* in 12 fathoms.

Current.—In December 1884, during a calm, the current was found setting across the above banks in an E.N.E. direction, at the rate of about $2\frac{1}{2}$ miles an hour.

Gasé island, lying 9 miles eastward of the north-east point of Ombi Major, is a flat table-land for about three-fourths of its extent, sloping down to each end, with a spit of rocks stretching about a cable's length from the south-east end. The island has a sandy beach, and is apparently surrounded by deep water. The channels on either side are safe; Gasé strait to the westward may be used with a westerly wind, but that to the eastward is wider, and seems better with a working wind.

Doubtful shoal.—The master of the ship *Talbot* reported in 1872 (*see* Mercantile Marine Magazine 1873) that his vessel grounded on and passed over a reef in lat. $1^{\circ} 51\frac{1}{2}' S.$, long. $128^{\circ} 3' E.$, with the east side of Gasé island bearing N.N.E. and High Peak on Gomono island W.N.W., where the latest charts mark no bottom at 70 fathoms.

No soundings were obtained and there was no discoloration of the water. The position by bearings does not agree with the latitude and longitude given.

MISOL, a large island 45 miles long and 15 to 20 miles broad, is but little known though of considerable extent. The interior is said to be inhabited by Arafura negroes, and the coast by a mixture of the negro and Malay races. It is generally level land, and of moderate height, and the shores are surrounded nearly on all sides by numberless small islands, the outermost of which to the north-west and eastward lie many miles off.

On the north side of the island, Kasiem road offers anchorage in a depth of 8 fathoms at half a mile from the shore; and on the south side is Efbe anchorage, visited by Captain Forrest in 1775. The channel to this latter anchorage, westward of Efbe island was partly examined by the *Marchesa* in 1883. Between the coral reefs extending from West channel island and those extending from Efbe, the entrance is about $1\frac{1}{2}$ cables wide, with depths of from 4 to 5 fathoms, deepening inside to 13 and 15 fathoms. There is anchorage in about 13 fathoms at one cable northward of the village on Coconut point, the north-west extreme of Efbe island. The channel eastward of Efbe island has not been examined.

Eastward from the south-east point of Misol a range of islets and scattered rocks extend for 40 miles, terminating to the east in False Pisang, or Daram island, 409 feet in height.

Off the north coast of Misol are numerous islets and several sand banks, only to be understood by reference to the chart, extending over more than half way across the channel between the island and Kofiau, leaving, however, a clear route 10 miles in width between the southernmost of the Kofiau islands and the northern position of Fitzmaurice shoal (*see below*), and leading towards Pitt strait.

The Kanari islands lie to the north-west of Misol and form an extensive chain of flat, wooded, uninhabited islands, leaving a narrow passage between some of the groups which lie close to Misol. Captain Forrest on his voyage to New Guinea in 1775 in search of the nutmeg tree, visited Great Kanari, the largest and westernmost of these islands, and found good water in a pond situated on the south end. He anchored in Round harbour, so called by him, lying between two small islands which are at a short distance on the east side.

Fitzmaurice shoal, a rocky shoal with less than 12 feet water over it, reported by the British ship *Fitzmaurice* in 1866, has two positions assigned to it, one with the Beehive hill on Kofiau island bearing N. by E., and the north extreme of Great Kanari S.W. $\frac{1}{4}$ W., distant about 12 miles; and the other position at the same distance from Great Kanari island with its north extreme bearing S. by W. $\frac{1}{4}$ W.

PITT PASSAGE, so named after the vessel of Captain Wilson (who first took this passage in 1758), but named the Serang Sea on the Dutch charts, is the broad channel extending from Celebes island on the west, as far as the meridian of Misol to the east; it is bounded on the north by the Sula and Ombi islands and the chain of small islands stretching thence to Kofiau; on the south it is bounded by Buru and Ceram islands.

This passage forms the second Eastern Route to China for sailing vessels described in the China Sea Directory Vol. III. A vessel bound for

See chart, 9426 [2,557], and plan, No. 912 [2,624].

China, arriving at the eastern straits in the months of December, January, or February, would find the route by Pitt passage and thence either by Pitt or Dampier strait or Gillolo passage into the Pacific, preferable to that by Makassar strait. This route would also be used by homeward bound vessels during the south-west monsoon in May, June, and July. The winds and currents in Pitt passage are very variable, and it may be crossed anywhere; it is, however, prudent to keep the weather shore when northerly winds prevail.

In case of falling to leeward of the north-west point of Buru every exertion should be made to pass it quickly. Instead of working to do this, it is better to run southward of the island, and pass into Pitt strait to the eastward of it. During the north-west monsoon vessels which leave Amboina make to the northward along the east coast of Buru, where the winds are variable and squalls come off the land, and where the currents are rarely strong and are sometimes favourable for the run northwards; while beyond Manipa and the channel that separates it from Ceram, southerly currents prevail in this season.

BURU (or BOURU) ISLAND, the third largest of the Moluccas, is 80 miles long, east and west, and 45 miles broad. It is exceedingly mountainous, especially in the north-west part, where mount Tomahu, the highest in the Moluccas, rises to 8,530 feet above the sea. Kaku Siel, 16 miles eastward of Tomahu, is not much lower, while Batu Bua, in the south-east part, is 4,500 feet in height. A large lake, Wakaholo, lies at the eastern foot of Kaku Siel, at the height of 1,900 feet above the sea; rivers from this lake flow to both the northern and southern shores.

The coast is in general bordered by a reef with deep water close to, and, with the exception of Kayeli bay on the east coast, affords no sheltered anchorage for large craft. The small native coasters find anchorage in the openings at the mouths of rivers, of which there are some twenty on the south coast, and four or five on the north coast. The mouths of all the rivers are obstructed by bars. Temporary anchorage for ocean-going vessels may be had at Bara bay on the north coast, at Uki road on the south coast, and also, it is reported, between Pela and Saroma points on the east coast.

Winds and Weather.—Buru is within the influence of the south-east and north-west monsoons; there is a regular wet and dry season, which varies on the northern and southern coasts. On the north coast the north-west monsoon brings rain, and the south-east monsoon dry weather; whilst on the south coast the south-east monsoon brings rain simultaneously with the rainy season at Amboina. The south-east monsoon lasts longer and brings more rain with it than the north-western, so that the rivers on the north coast, as well as those on the south, are swollen during that season. The climate is exceedingly moist, and reported to be unhealthy.

West coast.—Palpito point, the north-western extreme of the island, has a reef projecting about a mile from it; the coast trends in a southerly direction from this point for 24 miles to Sarmena point, and can be approached with safety to within a short distance, the coast dangers being indicated by the discolouration of the water. The three Tomahu islands lie just off the shore, and Fogi town, the principal one on the coast, is situated at the mouth of the river Nitu, opposite the southern Tomahu island. A rock lies about 2 miles southward of the southern Tomahu island, at the distance of about one mile from the Buru shore. A reef projects a short distance from Sarmena point.

Anchorage.—There is anchorage inside Tenga, the middle Tomahu island, eastward of the village on its north-east point, in a depth of 17 fathoms; the approach is southward of the island. Steer in N. 59° E. for a broad white sand-patch on the shore of Buru, and pass about 4 cables south of Tenga, leaving on the starboard hand a reef covered by $1\frac{1}{2}$ fathoms lying off the southern island. Having passed the south point of Tenga, steer more northerly for the anchorage, keeping midway between the island and the Buru coast. Further south, off the town of Fogi, there are many outlying dangers, and the anchorage is a considerable distance from the shore.

North coast.—From Palpito point the coast trends E.S.E. for 8 miles, and then turns north for about 2 miles, forming Bara bay, in which there are depths of 17 to 35 fathoms at half a mile from the shore, and upwards of 50 fathoms at three-quarters of a mile. The chart shows anchorage in a depth of 17 fathoms, about $1\frac{1}{4}$ miles from the head of the bay, and half a mile from the south shore.

Lisola is a town of small importance at the mouth of a river about 15 miles E. by N. $\frac{1}{2}$ N. of Bara bay; reefs project off the mouth of the river, and between these reefs there is anchorage for coasters during the south-east monsoon.

Wai Pelau (Labuan Kora Kora) affords anchorage in a depth of about 25 fathoms, sand, at the distance of $2\frac{1}{2}$ cables from the shore, which is steep-to eastward of the creek.

KAYELI BAY, on the north-east coast of Buru is 4 miles wide at the entrance between points Karbu to the northward, and Ruba to the southward, and penetrates about 4 miles to the south-west; both points are bordered by reefs, and there are depths of 6 to 25 fathoms at half a mile from the northern point, but the reef off the southern point is steep-to, and the water is very deep on that side till near the inner shore of the bay. The south-west shore of the bay is fronted by a shoal extending $1\frac{1}{2}$ miles off shore, with a very steep edge, the water shoaling rapidly from 20 to 2 fathoms within a cable's length.

See chart, No. 942a, and plan, No. 911 [2,522].

The south-eastern shore is fringed by coral reef to the distance of three-quarters of a mile, with 9 to 10 fathoms water at the edge. A detached shoal with a depth of 8 feet over it lies off this coast reef, with the mouth of Kayeli river bearing S. 12° W., distant $1\frac{1}{8}$ miles, and Ruba point N. 57° E. Wai Apu, which has its source in the Lumara hills to the southward, enters the north-west part of the bay. The northern part of Kayeli bay has not been surveyed.

Kayeli town is on the southern shore of the bay. It is controlled by a *posthouder* under the Amboina residency, and most of the native rajahs live here. Fort Defence, an old work of 1778, is a conspicuous object, with massive embrasured walls standing about 800 yards from the shore. The town was made a free port in 1854. The exports are Cajuput oil and dried fish. The Netherlands India Steamship Company's vessels touch here once a month; see page 30.

There is no pier at Kayeli; in northerly winds there is nearly always a surf on the steep sandy beach abreast the anchorage.

Anchorage.—In the south-east part of the bay there is a space about $1\frac{1}{2}$ miles wide between the reefs of the south-eastern and south-western shores, where good anchorage can be had, sheltered in both monsoons. The water shoals gradually from a depth of 50 fathoms at the distance of $1\frac{1}{2}$ miles from the shore, at the head of the bay, to 9 fathoms at about 2 cables from it. The best berth is in about 19 fathoms, with the fort bearing S.S.W., distant half a mile, and Red island, E. by N. Vessels under sail must be careful to shorten sail in time, and to let go the anchor on reaching a depth of 25 fathoms, as the water shoals rapidly to the westward.

Eastward of Red island there is a small inner harbour in which the depth is 6 fathoms; it is approached by a very narrow but deep entrance lying northward of the island. Small craft would find complete shelter here, but the anchorage space is very limited.

Land and sea breezes are generally regular; the land wind comes off about 5 or 6 p.m., and the sea breeze makes about 9 to 11 a.m. See p. 534.

Directions.—Steer in midway between the two entrance points until the north point bears N. $\frac{1}{4}$ E.; then keeping it on that bearing steer S. $\frac{1}{4}$ W. until the fort is distinguished; this mark will take a vessel direct for the anchorage. Vessels working under sail must give both points a wide berth.

Tides.—According to Belcher it is high water, full and change, in Kayeli bay at 1h. 32m., rise of tide $4\frac{1}{2}$ feet; but Horsburgh states that it is high water at 1h. 0m., and that tides rise about 6 feet, but are not regular.

Supplies.—Fresh provisions may be procured here, but are not plentiful; water of an indifferent quality can be obtained from a rivulet east of the fort.

EAST and SOUTH COASTS.—Pela point, the north-eastern extreme of Buru, can be passed close-to; from thence the coast trends nearly south to Saroma point, being about 600 feet high between these points. From Saroma it runs W.S.W. for 32 miles to Peka point, the southern point of the island; which must not be approached within a mile on account of a reef that projects from it.

Uki road.—Uki or Lota island, high, steep, and wooded, lies about 3 miles E.N.E. from Peka point, and one mile off shore. Wayo reef, which dries in parts, and is 3 miles in extent east and west, lies $1\frac{1}{4}$ miles east of Uki island with deep water between them. A shoal covered by 5 fathoms lies between Uki island and the shore. The town of Uki is on the main coast N.N.E. of Uki island and on the left bank of Liki river. Vessels can anchor N.E. of Uki island and southward of the town, in a depth of 12 fathoms.

Tifu bay is a small port in the district of Masarete on the south-west coast of Buru. The entrance, between two rocky points, is half a cable wide, and 11 to 14 fathoms deep. The port runs east and west about 3 cables, with a width of one cable and a depth of 6 to 9 fathoms. The shore is bordered by a steep reef, and there is a dry bank at the bottom of the bay.

Amblau island, 10 miles S. by W. from Saroma point, is 6 miles long W. by N. and E. by S., and 2,060 feet high. The channel between it and Baru is quite safe.

MANIPA STRAIT.—Between Manipa and Buru islands there is a good and safe passage, and one that is generally used by vessels from the Molucca passage to the Banda or Arafura sea.

Manipa island, about 13 miles E. by N. $\frac{1}{2}$ N. of Pela point, is 11 miles long W.N.W. and E.S.E., and 2,100 feet high; the coast reef extends to a distance of upwards of 8 cables from its west side. Suangi islet, $1\frac{1}{2}$ miles from the west extreme of Manipa, is 327 feet high. On the south side there is a low wooded islet, Tuban, with a reef off its southern side.

Anchorage may be had westward of the islet Tuban, in front of Kelang village (where there are the ruins of an old fort), in a depth of 14 fathoms, sand, with the *missigil* bearing N. 9° E., and south extreme of Tuban S. 58° E. The channel inside Tuban is spacious enough for large ships, and affords a well-sheltered anchorage; it cannot be used without local knowledge.

See chart, No. 942a [2,557], and plan of Uki road, No. 911 [2,632].

Kelang island is 10 miles long E.N.E. and W.S.W., 7 miles wide, and 2,400 feet high.

Kelang strait, between Manipa and Kelang, is 3 miles wide at the narrowest part, and quite safe; it is sometimes used instead of the wider strait of Manipa, but the tides in it are very strong.

Babi island is small and low; the passage between it and Kelang is only fit for boats, and the passage on the other side between it and Ceram is narrow and but 3 to 5 fathoms deep; this passage is used by small coasters.

Boano island is 12 miles long north-east and south-west, high and rugged to the westward, but low to the eastward. Depths of 11 fathoms have been reported at 4 miles west of the islets marked about the centre of the west coast (H.M.S. *Nassau*, 1872, and *Moluksche Archipel*, p. 209); recent Dutch charts show a depth of 1,720 fathoms not far from this spot. There are heavy tide rips about 10 miles westward of the north-west point of Boano. Broken water and tide rips extend for a considerable distance off the north-east point of Boano, to which a wide berth should be given.

The channel between Boano and Ceram is 3 or 4 miles wide, but is much contracted at its southern part by small islets and shoals which stretch along the Ceram shore. The strait can be navigated by day; the coast reef from Boano extends out about one cable from its south side, but the east coast should be passed at the distance of a mile.

CERAM ISLAND is about 180 miles long, east and west, and 25 to 35 miles wide. In the immediate vicinity of the coast the land is low and often swampy, whence it rises to a central table-land of considerable elevation, bearing a continuous mountain range which traverses the island from east to west. There are Dutch *post houders* at Wahai on the north coast, at Waru on the east coast, and at Amahoi on the south coast. A native pathway crosses the island over several mountain spurs from Sawai bay on the north coast to Makariki near Amahoi, and this is almost the only portion of the interior known to Europeans.

The island is subject to the Resident of Amboina, with the exception of the eastern extremity from Tobo to Waru, which, with the Ceram Laut and Matabela islands, is under the Assistant Resident of Banda.

Winds and Weather.—On the north coast of Ceram during the south-east monsoon, the weather is fine with regular land and sea breezes; the north-west monsoon is the wet and squally season, though it brings fine weather at Amboina, and probably all along the south coast; but there are no records of the weather on the south coast. During the north-west monsoon the wind is frequently fresh from west and W.N.W. during the day, dying away towards night and veering to the W.S.W. with a light breeze in the morning.

See chart, No. 942a [2,557].

NORTH COAST of CERAM.—From Talamun point, the north-west point of Ceram, the coast trends east, and is safe and steep-to for 47 miles, to where the chart shows a reef $2\frac{1}{2}$ miles off the coast; it then turns about E.N.E. for 10 miles to a low point, Paha, to the north and north-west of which, some 8 miles off, lie several low wooded islands, surrounded by shoals. Nusa Ela is the outermost of these islands, which are called Tugu islands in the *Molukse Archipel*. Nusa Ela should be given a birth of 2 miles, as reefs project some distance from it; the channel between the Tugu islands and Ceram is narrow, encumbered by reefs, and not recommended.

Sawai harbour.—Immediately to the east of Paha point there is a wide bay, named Selema from a village at the head of it. Sawai harbour, in the south-east part of this bay, is an inlet $1\frac{1}{2}$ miles long, and three-quarters of a mile wide, with a depth of from 20 to 40 fathoms, muddy bottom, affording good anchorage in the south-east monsoon. On entering the bay a vessel should steer south for a hill near Selema village, passing west of Kalapa and Atui islands standing on a reef which extends northward and westward from them to the distance of nearly a mile; and when clear of the reef she should haul eastward into the harbour.

Anchorage may be had near the Ceram shore with Atui island bearing north; there is also said to be anchorage off the village of Sawai in a depth of 15 fathoms, soft mud, with the fort bearing S.E. $\frac{3}{4}$ E., White cliff, the western point of the harbour, W. by N. $\frac{1}{2}$ N., and Atui island N.N.W. $\frac{1}{2}$ W.

Wahai and Hatiling bays lie about 25 miles eastward of Paha point, and directly westward of Sekola point, the northern extreme of Ceram. The coast as seen from the offing is nearly straight, it is therefore necessary when making for either of these bays to keep within 3 or 4 miles of the shore in order that the houses may be seen. The land in this neighbourhood appears to be more cleared than elsewhere.

Wahai, the western of the two bays, is a small inlet between reefs which extend 4 cables from the shore west of the bay, and for a cable further from the shore to the eastward; on the latter reef there are sand banks which partly dry. The inlet is about one cable in width and has a depth of 8 fathoms at the head. A wooden fort stands on a hill behind the village, and a mole extends out over the fringe reef into a depth of 3 fathoms. The anchorage is in 7 fathoms, half a cable from the end of the mole. For rainfall, see p. 574.

Directions.—Two ball-beacons mark the entrance of the inlet, one on either side, and other beacons mark the channel on each side to the head. The *Molukse Archipel* states that the head of the mole, bearing S.S.E. $\frac{1}{4}$ E., will lead in between the entrance beacons. The wooden fort

See chart, No. 942b [2,558], and plan, No. 930 [2,621].

above mentioned is a good mark when making the place from the westward. Sailing vessels can only enter with a leading wind; and in the north-west monsoon must either tow or warp out, as they are liable to encounter a swell outside and a set to the eastward before gathering way. The space is very limited and a vessel should either moor to the pier, or make fast by the stern.

Tides.—The information about the tides is rather discrepant; Lieutenant de Boer, in 1832, reported that there was only one tide in 24 hours, and that it was high water full and change at Oh. 30m. (which appears to be doubtful), the greatest range being $6\frac{1}{2}$ to 7 feet. The *Merman*, in 1839, reported that there was only one tide in the 24 hours, and that the range at full and change was between 3 and 4 feet; again Captain Hunter, in 1840, states that it is high water, full and change, at 6h. 0m., and that there is only one tide in 24 hours, the range being 8 feet.

Hatiling bay, one mile east of Wahai, is included between the eastern reef of that bay and the reef that borders Sekola point to a quarter of a mile out and nearly dries. The entrance, which is less than 2 cables wide, is 4 cables west of Sekola point, and has a depth of 20 to 29 fathoms. The bay penetrates $1\frac{1}{4}$ miles S. by E. $\frac{1}{2}$ E. from the entrance to the head where there is a village, the depth of water gradually diminishing to the southward. A small shoal, covered by 3 feet water with 7 fathoms close to, lies in the middle of the bay east of Aentopra point, the western point of the bay, and N.N.W. of New Hatiling village. The anchorage is $2\frac{1}{2}$ cables N. by W. of the village in a depth of 14 fathoms, mud; the southern end of the bay is very shallow.

Supplies.—Wood, water, and some fresh provisions can be procured at Wahai and Hatiling bays.

Coast.—From Sekola point the coast trends about E. by S. for 53 miles to Lama point, and then E.S.E. for 14 miles to Timor point, the north-eastern extreme of Ceram; it is fringed by a narrow reef throughout the whole of the distance. Anchorage may be had in Kobi bay, 23 miles eastward of Sekola point; and as the coast is clean, can be everywhere approached by the lead, and good anchorage found with off-shore winds.

Bula bay, about 8 miles E.S.E. of Lama point, affords anchorage off a village of that name in a depth of 11 fathoms, with the flagstaff bearing S. 11° W., distant half a mile, and a conspicuous tree near the beach N. 53° W.; small vessels can anchor a little further in. The landing place is near the flagstaff on a sandy beach which dries out to the distance of about $2\frac{1}{2}$ cables; high water is the best time for landing.

At a short distance inland, petroleum springs have been discovered; this part of Ceram is therefore likely to become of considerable importance.

See chart, No. 9426 [2,558], and plans, Nos. 930 [2,621], and 911 [2,622].

Louwarden bank, the west end of which is 7 miles E.N.E. from Lama point, is 2 or 3 miles in extent, and very dangerous; the east end is a white sand bank, and on the western side is a ledge of rocks, some of which are above water. There is deep water near the bank, and the channel between it and the mainland is considered to be safe.

Waru bay.—From Timor point the coast trends south for 20 miles, and then turns east for 10 miles, forming the great bay of Waru, with the town of the same name at the head of it. Anchorage can be had off the town in a depth of 12 fathoms, mud, and also off Baru, a village 5 miles to the northward. The coast between Baru and Waru is bordered by a broad reef, as is also the coast from Waru to the eastward.

Steer for the anchorage off Waru with the pier, flagstaff, or the prison with tiled roof bearing South; and anchor with the east point of the roadstead in line with the furthest eastern land bearing N. 82° E. When approaching from the East, run through the passage south of Parang until the north-west point of that island bears N. 43° E., when steer S. 43° W., with that bearing on astern, for the above position. The sandy beach in front of the town dries out to the distance of nearly a cable.

Parang island, 4 miles north of the east point of Waru bay, is 4 miles long north-west and south-east and sandy: it can be seen at a distance of 20 miles. It is surrounded by a reef which extends 2 miles to the northward, and should be given a wide berth.

Hu point, the eastern extreme of Ceram, has an islet, Akat, to the northward of it, connected to the point by a reef. The chart shows anchorage between Akat and the coast of Ceram. Orlem rocks lie 4 miles N.N.W. of Hu point, and Razaket islet close to the coast about 2 miles to the southward. The coast south of Razaket is clean and steep-to.

Madurang island, 11 miles E.S.E. of Hu point, is small, high, sandy, and wooded. It has a small reef on the south side, but the other sides can be approached with safety.

Keffing islands are included on a large reef which likewise embraces the south point of Ceram as far as 6 miles to the westward along the south coast, and extends 3 miles out to the southward and eastward. Little Keffing, the eastern island, is low, sandy, and well populated.

Keffing strait is the passage between the reef off Keffing islands, upon the south-east side of which there is a sand-bank which uncovers at half-tide, and that to the eastward surrounding Gisser island, upon which there are two sand-banks. The northern entrance appears to open towards the N.W., north of Little Keffing, and the southern entrance to open to

the S.S.W., south of Little Keffing; but the charts differ very much about this locality, and are not to be trusted. The narrowest part of the channel appears to be about a mile wide, and the depth from 12 to 30 fathoms, shoaling to 8 fathoms near the reefs. The tidal streams are very strong in the passage, and the over-falls heavy.

CERAM LAUT.—"Ceram out to the sea" is a cluster of islands on one coral reef, 18 miles long, which, as usual, is very shoal at the edges, and drops at once into deep water. Gisser and Kilwaru islets to the westward and the three Goram islands to the E.S.E. are included in the group. The most important islands are Gisser and Kilwaru, separated from each other by a narrow channel, which affords good anchorage in both monsoons in a depth of 10 fathoms, sand and coral. The population of the group in 1881 was given as 2,000.

Gisser is a low, sandy, atoll-formed island, surrounded by a reef which extends $2\frac{1}{2}$ miles towards the south, and has on it two sand-banks above water. Over the entrance of the lagoon which is on the east side, there is a bridge with an opening for the native craft to pass through at high water. Boats can lie at the pier-head during the lowest tides. The anchorage is $1\frac{1}{2}$ cables east of the north-east point of Gisser; vessels should moor. There is a government depôt of coal at Gisser, but coal can only be obtained by means of an order from the Resident of Amboina. The stock in store is only about 200 tons.

Communication.—See page 30.

Kilwaru is a small sandy islet only a few feet above the level of the sea, the houses being built on piles; but it has, nevertheless, a large Bugi and Ceram population, and is largely resorted to by traders from New Guinea, the Aru, Ké, and other islands, as well as by those from Celebes. The principal articles of trade are trepang, pearl-shell, edible birds' nests, &c. The Ceram Laut reef extends 2 miles out on the north-west side of Kilwaru, which islet can, therefore, only be approached by boats on this side.

Ceram Laut, the largest island of the group, is high and hilly, and had in 1898, an exceedingly high tree on it which makes a good mark. The other islands on the reef are low, except Kidan, which is high.

Directions.—When approaching the anchorage off Gisser island from the southward, steer N.E. by E. for the remarkable tree on Ceram Laut, which will then be in line with a cross-beacon standing on the shore reef, and continue that course for the beacon after the tree has disappeared behind the high land of the island, until the west extreme of Gisser is in line with the south-easternmost ball-beacon on the reef bordering that island. Thence keep midway between the above ball-beacons on the Gisser reef,

See chart, No. 9426 [2,558], and plan, No. 930 [2,621].

and the cross-beacons on the reef extending westward from Ceram Laut, up to the anchorage.

From the north, steer towards Kelling strait until the north-east point of Gisser is in line with the south-west extreme of Ceram Laut, when alter course in that direction, and keep between the beacons marking either side of the channel.

When the tide is very strong, it is advisable for steam-vessels with a fair tide to pass through the strait and re-enter it with the stream ahead, to avoid risk to cables in anchoring.

Tides.—During October and November it is high water, full and change, at Gisser, at 2 h. ; rise of tide $4\frac{1}{2}$ feet. The flood tide sets to the north at the rate of $2\frac{1}{2}$ knots an hour at springs; and ebb to the south. The change of stream from north to south occurs 2 hours after high water, at springs.

Kon or Gono islets are described in the *Moluksche Archipel* as the most easterly on the reef, but the chart shows a 10-fathoms channel between these islands and the Ceram Laut reef.

The Goram islands consist of Suruaki, Goram and Manavoka. Suruaki (Panjang) is surrounded by a reef, leaving only a narrow passage to the north between it and Kon islets reef; it is not advisable to attempt this passage, but the channels between the Goram islands are safe. Goram itself, the easternmost, is about 8 miles long N.N.W. and S.S.E.; the centre is high, but the coast is low and fringed by reefs which dry at low water. The island is well populated, and carries on a fair trade with New Guinea.

During the south-east monsoon anchorage may be had on the western side between the reefs and the shore near the village Ondur in 14 fathoms. The entrance to this anchorage may be made by bringing a small round hill, higher than the adjacent hills, to bear N.E. by N., and then steering for it on that bearing; but it would be dangerous to enter without a pilot. During the north-west monsoon there is anchorage off Kailakat on the south-east coast in a depth of 17 fathoms, but here, also, a local pilot is required, as the bay is obstructed by reefs.

Manavoka, the southern island, is the highest of the group; it is steep-to, and affords no anchorage.

The MATABELA ISLANDS, are under the control of the Rajah of Goram. They are sparsely inhabited, carry on very little trade, and afford no safe anchorage. Inga, the northern islet, lies 12 miles S.E. of Manavoka; the channel between them is clear. Inga and Watubela are connected by a reef, and are both high islands, the latter having an elevation of 688 feet. Kasiwni is the largest and highest of the whole group;

See chart, No. 942b [2,558].

there appears to be anchorage eastward of its southern point. Baan islands, are two small uninhabited islets 269 feet high and surrounded by a reef, lying about $4\frac{1}{2}$ miles S.S.E. of the south point of Kasiwui. Kurkap island 4 miles N.E. by E. of Baan, is a small sandy islet 115 feet high, surrounded by a shoal of sand and rock which extends 2 miles south-eastward of the island. The *Triton* in 1928 passed between Kasiwui and these three islands and observed no dangers.

Towa island is about 1,280 feet high, and sparsely populated. The *Nautilus* in 1838 passed between Towa and Baan without observing any dangers, though the native pilots on board reported the passage to be foul. Uran island, 98 feet high, 6 miles east of the south point of Towa, is small, sandy, and wooded, and surrounded by a reef.

The group to the southward are described in the next chapter.

The SOUTH COAST of CERAM is high and steep-to, with no known dangers off it except those off Keffing island and the south-east point, and those near Hoya point. It is indented by three great bays, but these only afford anchorage very close to the shore. In each monsoon a counter current will generally be found close to the coast which can be utilized by vessels working against the monsoon. The south-east point of Ceram, as stated above, is surrounded by a reef, and the coast is foul for 14 miles W.N.W. as far as Gosai islet, and should not be approached within 4 miles.

Kisa Laut affords secure anchorage in the south-east monsoon, the bottom sloping gradually from 20 to 5 fathoms, sand. Osong peak, a sugar-loaf hill, 1,000 feet high, lies north-west of the road. Water can be obtained here but with difficulty. For about 8 miles westward of Kisa Laut the chart shows some shoals and rocks extending out more than a mile from the shore.

Hoya or Teluti bay is about 18 miles wide and 5 miles deep to the northward. There are some shoals on the east side near the point, and also two banks in the north-west part of the bay near the shore. The western point of the bay, Hoya point, is low and shelving, with a reef extending from it one mile south-eastward, which has two low islets on it; this reef runs 7 miles along the shore to the westward of the point. There is anchorage in a depth of 10 fathoms off Tehoru about 2 miles north-west of Hoya point, off the village of Awa, and also off the town of Teluti on the north shore of the bay.

A large reef is reported by the pilots to lie off Tamilan village, situated about 17 miles westward of Hoya point.

Elpaputi bay, 40 miles west of Hoya bay, is about 10 miles wide between the entrance points, and penetrates 10 miles to the north-east; the whole coast of the bay is steep. In the south-east part of the bay

there is a little port, Amahoi, the east shore of which is low, marshy, covered by mangroves, and bordered by a reef nearly dry at low water, which fills up half the bay, leaving between it and the western shore a channel nearly one-quarter of a mile wide, and with a depth of 6 to 25 fathoms. A patch of $3\frac{1}{2}$ fathoms lies at the head of the port, and a shoal with $4\frac{1}{2}$ feet over it at low-water lies in the roadstead N.W. of the pier at the head of the port, and distant about 175 yards from the shore. The anchorage is on uneven ground in a depth of 6 to 18 fathoms, and lies about $3\frac{1}{2}$ cables N.W. by W. of the pier at about $1\frac{1}{2}$ cables from the low western shore which is steep-to, and can be kept close aboard on entering. For rainfall, *see* p. 574.

There is no other good anchorage in Elpaputi bay, and temporary anchorage can only be found (in 26 fathoms) off Makariki, a Christian village on the east side of the bay 8 miles from Amahoi, where at high water a boat is able to enter the river; and off Mani on the west side, in a depth of 10 fathoms, sand, at about half a cable from the steep-to shore. During the south-east monsoon there are heavy breakers along the north-west shore, making landing very difficult. October to December is the best time for communicating.

Vessels proceeding from Elpaputi bay to Piru bay should keep in mid-channel between Ceram and the off-lying islands in order to clear the reefs off the coast near Rumakia village, and a reef lying half a mile northward of Haruku island.

Piru bay, the westernmost on the south side of Ceram, is a wide bay, bounded on the west by the peninsula which terminates in Sial point; and fronted on the south by the island of Amboina. The islets Babi and Kasa lying towards the head of the bay, are connected by reefs leaving a narrow channel between Babi and the coast of Ceram; at the northern end of this channel is Kaibobo road in which there is anchorage in a depth of 18 fathoms. Reefs which dry, and are marked by fishing stakes, lie N. 41° W. from the western extreme of Babi island at the distance of $2\frac{4}{10}$ miles and $3\frac{7}{10}$ miles, respectively. About one mile N. by W. $\frac{1}{2}$ W. from the latter there is a third reef about a cable in extent.

There is anchorage in Piru roadstead at the northern end of the bay, in a depth of 15 fathoms, southward of two small reefs; the outer reef about a quarter of a cable in diameter and with a depth of 6 feet, lies half a cable S.W. by W. $\frac{1}{2}$ W. from a reef which dries and is marked by a beacon. There is also anchorage in Piru bay off the villages Waisamu, Loki, and Luhu. The shore of Ceram eastward of Babi is bordered to a distance of 6 miles by a reef which reaches out 2 miles from it. Sial point is steep-to.

See chart, No. 942a [2,557], and plans, Nos. 930 [2,621] and 911 [2,622].

WEST COAST OF CERAM.—Ceram island terminates to the westward in a peninsula 5 to 15 miles wide, the outer coast of which trends south-west from Talamuru point for 26 miles to Haja point, the western extreme of Ceram; it then turns southward for 25 miles to Sial point. On the east side of this peninsula is Piru bay. Some small islets and reefs stretch along the north-west shore from Talamuru to Haja point; the range of hills terminating at Sial point is over 1,300 feet high.

Gunong Sudi anchorage, south of a group of islets about 6 miles eastward of Haja point, has a depth of 22 fathoms at 7 cables from the shore; and 19 fathoms at the distance of 2 cables, with mount Sudi, a coast hill, bearing N.E. by N., and the south point of Nitu (the innermost of the islets) bearing N.W. There is a watering place at the foot of mount Sudi.

The **AMBOINA ISLANDS** consist of Amboina, Haruku, Saparua, Melano, and Nusa Laut. They are all high, and when seen from the southward appear as part of Ceram. The passage between these islands and Ceram is safe, but in working through it a wide berth should be given to the north coasts of Saparua and Haruku on account of the reefs that project from them. The coast of Ceram is said to be clean, except off and eastward of Rumakia.

AMBOINA ISLAND is the most important of the spice islands, and the town of Amboina is the seat of the government of the Moluccas. The island consists practically of two islands of unequal size lying parallel to each other their greater lengths being in an E.N.E. and W.S.W. direction, united at one point by a low sandy isthmus less than a mile in width. The northern, and larger, peninsula, called Hitu, has a length of about 30 miles with a maximum width of 10 miles; it is very mountainous, some of the peaks rising to over 3,000 feet. The southern peninsula is about half the size, and the highest mountain rises to 2,167 feet.

The **Three Brothers** are three islets lying off the north-west coast of Amboina, the northernmost of the three is 382 feet high. There is a passage between them as well as between the southern islet and the coast, but the tidal streams between are exceedingly strong.

Amboina bay.—This deep inlet penetrates into the island some 14 miles from the south-western end in a N.E. direction, its entrance points being Allang point on the west and Nusaniva on the east. These points are both steep-to and bear East and West from each other, nearly 6 miles apart. About 3 cables length S.S.E. of the latter point there is a narrow bank of soundings of from 15 to 20 fathoms, on which a vessel might

See chart, No. 942a [2,557], and plan, No. 911 [2,622].

anchor during a calm ; it is detached from the shore, for no bottom is got when Allang and Nusaniva points are just open, or touching each other.

Inside Nusaniva point there is a small indentation, called Portuguese bay ; but no soundings at 60 fathoms are obtained on either side at the distance of a cable from the shore, nor within half a cable's length in many places until well up.

The town of Amboina is situated about 8 miles from the mouth on the east side of the bay, which is bordered here for $1\frac{1}{2}$ miles by a steep bank about a cable wide ; the edge of this shoal is generally marked with fishing stakes, which may also be seen in many parts of the bay ; the water deepens rapidly from the bank, and a depth of 40 to 50 fathoms will be found at a distance of 3 cables from the shore.

The town is clean, neat, and regularly built, with straight and wide streets intersected by numerous streams, and bordered by a profusion of flowering shrubs. It contains two churches, a fine hospital, a town hall, and other buildings. The mercantile part of the town is in a long street facing the sea, with another behind it. As in other Dutch towns in the east, there is a distinct Chinese and Arab quarter and most of the retail trade is in the hands of Chinese.

Fort Victoria is an irregular hexagon facing the sea ; in front of it is the ordinary landing-place, and the main road to the town passes through it, there being only a pathway outside the glacis to the town. The jetty in front of the fort is about 80 yards long, of rough stone, except at the outer end, which is of wooden piles ; the depth of water at the steps is about 2 feet at low water ; at the outer end it is 2 fathoms. At half a mile south-westward of the landing jetty there is an iron pier, at which large ships lay for lading and unlading.

Position.—The flagstaff of fort Victoria is in lat. $3^{\circ} 41' 10''$ S., long. $128^{\circ} 10' 44''$ E.

Light.—From a mast at the end of the pier fronting fort Victoria, at the height at 25 feet above high water, a *double fixed* light is shown vertically, *red* above and *white* below ; these lights are not to be depended on, and are difficult to distinguish from the other local lights.

Anchorage.—The best anchorage is about $1\frac{1}{4}$ cables westward of the Fort jetty in 25 fathoms, with the fort flagstaff bearing E.S.E. Outside this position the water is inconveniently deep for anchoring. The old practice of securing a hawser to anchors on the bank to prevent drifting off into deep water is recommended for vessels making a comparatively long stay.

The red buoy to the northward of the landing jetty is lightly moored, and intended only for the small Government steamer frequenting the port.

See plan of Amboina bay, 2,611 [2,623].

Supplies.—Fresh meat and bread are dear, but other provisions, including game, fish, fowls, and every variety of fruit, are abundant and moderate in price. There are no facilities for watering ships in the stream, but water can be obtained from a river on the north-west shore of the bay opposite the town. Water of good quality can also be had when alongside the iron pier, by pumping it through tubing, directly into a vessel, from a well near the inner end of the pier.

Coal-wharf.—The coaling wharf is at Tanjong Mungayen, a little more than a mile south-westward of the town pier, and there is a depth of 4 fathoms alongside the pier-head at low water. This pier (1900) is falling into decay, and the bay is silting up with sand at this part. A new iron coaling pier is to be built at the point a little to the westward of the old one.

Ships intending to coal at the wharf should steer in with their heads to the south-eastward, keeping about half a cable outside the extremity of the wharf, and when the middle of the ship is abreast the centre of the wharf let go the port anchor in a depth of 10 fathoms and haul in by means of the wooden piles placed at convenient distances along the shore.

A large quantity of coal is stored here, principally Welsh and Australian, the price being about 2*l.* 16*s.* per ton. Labour can be had at the rate of a Dutch rupee of 1*s.* 8*d.* a day; 120 tons is the quantity put on board in an ordinary day's work.

Inner harbour.—The entrance to the inner harbour commences at 1½ miles above the town; it is 1½ cables wide between the sandy flat on the south shore and the steeper north shore, and 5 to 10 fathoms deep; it then widens out into a large basin, 3 miles long by 1½ miles broad, with tolerably even depths over it, varying from 12 to 18 fathoms. It is well sheltered from all winds, but is considered unhealthy, and is not used by ships. The head of the harbour is separated from Baguala bay on the eastern side of the island, only by the narrow sandy isthmus that connects the two peninsulas into which Amboina is divided.

Communication.—From Amboina there is contract service every twelve weeks to Waihai, Ternate, Gani, Patani, Saonek, Samatti, Sorong, Dorei, Roon, Ausus, Jamna, Humboldt bay, and back to Amboina, calling at the same ports. Also from Amboina every twelve weeks to Banda, Gisser, Segaar, Fak Fak, Dobbo, long. 142° E. on the south coast of New Guinea, and back to Amboina, calling at the same ports.

Tides.—It is high water, full and change, in Amboina bay at 0*h.* 30*m.*; springs rise 8½ feet, neaps 3½ feet. The tides are very irregular, being governed chiefly by the winds. The tidal streams in the bay are weak, and are also greatly influenced by the wind.

Weather.—From a meteorological register kept at Amboina, extending over a period of four years ending 1874, it would appear that the north-west monsoon commences about November and lasts till April; but only during January, February, and part of March do the winds blow steadily, and then between north and north-west. The south-east monsoon blows from May to the beginning of September, after which it becomes variable to the end of November. In December the wind is variable from north through west to south, and in March and April from north-west to south-west.

Rain falls in every month of the year, the least being experienced from October to April inclusive, with an average of 13 days' rain, and a fall of 8 inches for each of these months. The other months average 21 days' rain, with a fall of 27 inches. See p. 574.

The mean temperature for the whole year ranges from 74° to 86° Fahrenheit.

South and east coast of Amboina.—From Nusaniva point the coast runs E.N.E., bordered by a narrow reef for 15 miles, and then turns into Baguala bay. This bay, which is 3 miles wide at the entrance and runs in about 5 miles, has many large shoals and reefs in it with deep water close to them; the depth of water diminishes rapidly at the western end, and is only 5 fathoms at 2 miles from the head of the bay. To the north of Baguala bay the coast forms a bight, in which the chart shows anchorage without stating the depth of water; northward of this bight, the coast reef is about 1½ cables wide.

North coast of Amboina.—This is very steep-to, with depths of 20 to 30 fathoms close to the shore reef, which is nowhere more than a cable in width; there is a small settlement at Hila, but no secure anchorage for vessels of any size on account of the great depth of water. Good anchorage may be had off Sait village in a depth of 14 fathoms, sand, with the flagstaff bearing S.S.W., and Sait point West.

Haruku island is roughly triangular with the apex to the east, about 9 miles long, and 1,200 feet high in the centre. On the north side of Haruku there is a bank above water, and a narrow reef borders the north-east, east, and south coasts. The channel between this island and Amboina is 3 miles wide at the southern end, but is reduced to a width of 2 miles at the northern end by Pombo islet, and a reef eastward of it. Pombo islet is sandy and surrounded by reef to the distance of 1½ cables.

The detached reef in the fairway between Haruku and Pombo lies with the north point of the islet bearing W. by S. ½ S., is 2½ cables in diameter, and dries; the reef is steep-to and between it and Haruku there is a depth of 70 fathoms.

See chart, No. 942a [2,557].

Saparua island has a hill some 1,000 feet high on the north-west end, but the east coast appears low. The channel between Saparua and Haruku is from one to 2 miles wide; in the narrowest part, near the north-east extreme of Haruku, the shore reef of that island extends to the distance of $2\frac{3}{4}$ cables, and from the north-west point of Saparua for about one cable; great care is necessary at this part, but the reefs are discernable at low water. A vessel using it should keep on the Haruku side, as the reefs on the Saparua side extend to one mile from the shore. The tidal streams in this channel are very strong.

Saparua bay is on the south side of the island; the inner part, lying between Paperu point and Torana point opposite, affords good anchorage in the north-west monsoon. The bay is fringed by reef which extends 2 cables out on the south side, and $3\frac{1}{2}$ cables in one place, on the north side. A reef is reported to exist, lying with fort Durnstede bearing N. 2° W., distant about 4 cables, and Paperu point S. 47° E. The town of Saparua is on the north shore near the head of the bay. The best anchorage is in a depth of 10 fathoms, sand and mud, 2 to 3 cables S.E. by S. of fort Durnstede; care must be taken not to approach nearer to this fort, as there are patches of 2 to 3 fathoms at the distance of $1\frac{1}{4}$ cables from it. For rainfall, *see* p. 574.

Tides.—It is high water, full and change, at Saparua island, at 1h. 0m., springs rise 6 feet.

Melano islet, south-west of Saparua, is about 700 feet high, steep-to to the south-east, sloping to the north-west.

Nusa Laut, the easternmost island of the Amboina group, is about 3 miles long north-east and south-west, 800 feet high, and bordered by a reef, which extends to a quarter of a mile from the shore. Nalahia bay, on the north coast, affords anchorage sheltered from the south, in a depth of 20 fathoms, one cable east of a scarped point on the west side, with the flagstaff bearing S.W. by W. and a white beacon on the east shore E.S.E., distant 2 cables.

The **BANDA ISLANDS** consist of ten islands, six of which lie close together, and between them form the harbour of Banda. These last are Gunong Api, Neira, Lontar or Great Banda, Kraka, Pisang and Kapal. The others are detached, and lie within a radius of 17 miles of Gunong Api.

Winds and Weather.—The north-west monsoon sets in about the middle of November, and occasionally blows with violence; the south-east monsoon seldom blows so fiercely. Rain falls in both monsoons, the dry months being September and October, when light variable winds and calms prevail. *See* p. 574.

Suangi, the north-western island, 16 miles N.W. of Gunong Api, is very small, and about 400 feet in height; Rhun, 12 miles W. by S. of Gunong Api, is 620 feet high, and has a reef on the northern side, with an islet upon it; Wai is 5 miles W. $\frac{1}{2}$ S. of Gunong Api.

Gunong Api is a steep volcanic cone, 2 miles in diameter, and 1,858 feet high. It is clothed with bushes to within 700 feet of the summit, and continually emits sulphurous steam; the eruptions of this mountain have been frequent and destructive; the last one took place in 1852.

Neira island, on the eastern side of Gunong Api, is about $1\frac{1}{2}$ miles long north and south, and rises to a height of 795 feet; on the summit there is a flagstaff and signal station. The European settlement and seat of Government are at the southern end. A reef, about a cable wide, borders the island on its northern, eastern, and southern sides. Fort Nassau stands on the south-west point of the island. Three piers run out from the shore; one, the commercial pier, where steamers discharge, is near fort Nassau; the depth of water at the head of this pier is 14 feet at low water springs; another, the official pier, is farther east, opposite the Resident's house. The third is a small pier on the west side of the town.

The channel between Neira and Gunong Api, named Sun strait, is of irregular breadth and depth, and at the southern end is less than half a cable wide, and only 3 fathoms deep; tidal streams run through it with great force, and it is seldom used except by small vessels. Kraka islet lies in the middle of the northern entrance, the passage between it and Gunong Api being better than the passage between Kraka and Neira, which is narrowed by reefs on both sides.

Great Banda island, or Lontar, is crescent shaped, 7 miles long by one to $1\frac{1}{2}$ miles broad, with a central ridge 700 to 800 feet high at the extremities, and 1,500 to 1,700 feet high in the middle. The western half of the northern shore is bordered by a reef which extends 2 to 3 cables out, and considerably narrows the channel between Lontar and Gunong Api; the rest of the island is also fringed by a narrow reef, which is widest in the little bays of the outer coast, making landing from boats difficult. The principal nutmeg plantations are in this island.

Pisang and Kapal islands are continuations of the north horn of the crescent of Lontar, separated from it and each other by deep channels about 3 cables wide, and free from danger, but the eddy currents in them are strong. Pisang is entirely planted with cocoanut palms, and is said in the *Molukse Archipel* to be the Lepers' island. Kapal is only a bare rock.

Anchorage.—Soundings of 25 fathoms commence three-quarters of a mile east of the south point of Neira, and from these lessen gradually to

See chart, No. 942b [2,558], and plan, No. 1,460 [2,575].

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5 fathoms at the western part of the roadstead. The anchorage is in a depth of 7 fathoms, with the south-eastern point of Neira bearing N.E. by N., and fort Nassau N. by W., about one cable east of a detached shoal of 3 fathoms. By keeping the south-east point of Neira open of the north point of Lontar a vessel will keep outside this shoal. The bottom is hard and it is recommended that vessels should moor to prevent fouling the cables.

Tides.—It is high water, full and change, at 2h. 0m., rise of tide at springs about 9 or 10 feet. The Austrian corvette *Saida* reported, in 1885, that the flood stream runs from Gunong Api towards Pisang island at the rate of 3 knots an hour.

Directions for Banda harbour.—The western or Lontar channel is reduced to an available width of one cable by the reefs on the south side; the Gunong Api side should therefore be kept close aboard in using this channel. Two black ball-beacons marked this fairway in 1900; the western beacon was reported to be on the edge of the coast reef extending from Lontar, the easternmost as being about 11 yards from the south-east point of Gunong Api. The eastern or Neira channel, between Neira and the north point of Lontar, is quite clear. Sailing vessels enter by the eastern channel during the south-east monsoon, and go out by the western; they take the contrary direction during the north-west monsoon.

Trade.—The principal exports are nutmegs, cloves, and oil extracted from the Kanari tree, besides a small amount of trepang and birds of Paradise from New Guinea. The European trade is in the hands of one commercial house, the *Nederlands Handel Maatschappij*; the retail trade and the trade with New Guinea, Ceram, and Ké islands is carried on by Chinese.

Communication.—The port is rarely visited by any European vessels, save only the mail steamers, for which see page 30.

Supplies are scarce and dear; water can be obtained by the Lontar shore, at a place E. by S. of the anchorage. Coal is generally to be had, but the supply is always small, and not to be relied on.

Rozengain island, 5 miles E.S.E. of Great Banda, is 800 feet high, appears to be clean-to, and has a small islet off its north-east point; it is inhabited, and nutmegs are grown there.

Rozengain reef lies 2 miles S.E. $\frac{1}{2}$ S. of Rosengain island; the sea breaks heavily over it.

See plan, No. 1,460 [2,575], and chart No. 9426 [2,558].

CHAPTER XII.

BANDA SEA ; KÉ, ARU, SERWATTI, AND TENIMBER
ISLANDS.

Variation $2^{\circ} 30'$ E. in 1902.

BANDA SEA.—The space between the south-east portion of the Celebes and the islands lying off it on the one hand, and New Guinea on the other, having Ceram on the north and the chain of islands extending eastward from Timor on the south, has been called the Banda sea.

All the islands in this sea are subject to the Dutch government, who have a *posthouder* at the principal places. Steamers of the Netherlands India Steam ship Company visit the islands periodically ; *see* page 30.

The Banda islands would be properly included in the description of this sea, but for greater convenience they have been given in the last chapter with the Amboina islands. The Buton islands and the chain of islands from Timor westward are out of the scope of this work. Wetta and the islands from Timor eastwards are included in this chapter.

Soundings and Temperature.—Three deep soundings were taken by the *Challenger* when crossing the Banda sea, the greatest depth attained being 2,800 fathoms N.E. of Bird island ; five other depths of over 2,000 fathoms are recorded on the chart. In the serial temperatures taken by the *Challenger* the temperature remained the same from 900 fathoms to the bottom, indicating that the depth of water over the ridge separating the basin of the Banda sea from the Pacific and Indian oceans does not exceed that depth.

Tides.—The recorded observations of the times of high water, and of the direction of the tidal streams, are unfortunately too few to afford even a fair estimate of the movements of the tides. The tidal wave enters the Banda sea from the North by the Molucca passages and Pitt channel ; and from the S.W. by the channels on either side of Timor ; but the place of meeting of these waves has not been determined. The only reliable information obtained as yet is as follows :—According to the *Molukse Archipel* the flood stream in the Banda sea sets to the east, and H.M.S. *Flying Fish* observed off the Aru islands that the flood-tide set in a S.E. direction at the rate of 2 knots an hour. The tides are probably largely

See charts, Nos. 942a [2,557], and 942b [2,558].

influenced by diurnal inequality, as sometimes only one tide has been observed in the 24 hours.

Winds, weather and currents have been described in Chapter I.

BANDA ISLANDS.—See page 466.

Turtle islands are three small wooded islands, low, and surrounded by coral reefs to a distance of 2 or 3 miles; they are therefore dangerous to approach at night. The northernmost of them is shown on the chart in lat. $5^{\circ} 22' S.$, long. $127^{\circ} 45' E.$; but was reported by H.M.S. *Penguin* to be 3 miles further East. The others lie, respectively, South 4 miles, and S.W. 2 miles from it.

Lucipara islands, 11 miles W.S.W. of the Turtle islands, are a group of five low-wooded islands on a reef occupying a space of 5 miles in length E.S.E. and W.N.W.; they cannot be seen more than 12 miles from the deck. The channel between Lucipara and Turtle islands is reported to be safe.

William reef, about 3 miles in extent, lies with its nearest part about 2 miles S.W. of the Lucipara islands.

Gunong Api island, about 3 miles in diameter, is a conical volcano, 1,378 feet high and visible at the distance of 45 to 50 miles, from the summit of which smoke is generally issuing. It is steep-to and may be approached with safety. The peak is situated in lat. $6^{\circ} 39' S.$, long. $126^{\circ} 35' E.$

Mano or Bird island is about one mile long N.N.W. and S.S.E., and half a mile wide, rising like a prism with its sides sloping from the sea at an angle of about 30 degrees to the summit, which is 880 feet high. On the southern side there is an open crater from which sulphurous vapour freely escapes; the lower part of the northern side is wooded, but on the higher slopes the trees have been killed. A coral bank projects 2 cables from the N.N.W. point, where there is a black sand beach; the rest of the island is steep-to. The summit is in lat. $5^{\circ} 33' S.$, long. $130^{\circ} 18' E.$

Matabela islands.—See page 459.

Bun and Kur islands.—At 31 miles S.E. $\frac{3}{4}$ S. from Towa, the southernmost Matabela island, there is a group consisting of Bun, Kaidos, Kaimeer, and the larger island Kur. The islands are all of them wooded. Bun, the northernmost, is in lat. $5^{\circ} 9' S.$, long. $132^{\circ} 0' E.$ Kaidos is shown on the chart to be connected with Bun by a reef; both islands are low. Kaimeer, standing on a continuation of the reef, lies about 4 miles S.S.E. of Bun; it is about 150 feet high.

Kur, the southernmost island of the group, is about 5 miles long N.E. by N. and S.W. by S., and rises to the summit by a succession of

See charts, Nos. 942a [2,557] and 942b [2,558].

beach-like terraces. The peak, which is 1,608 feet high, is in lat. $5^{\circ} 22' S.$, long. $131^{\circ} 58' E.$

Three Brothers are a group situated 12 miles south of Kur, consisting of three small islands lying about 4 miles from one another; each island is fringed with a narrow coral reef, and the passages between the islands are free from danger.

Winin, the north-western island of the group, about half a mile in diameter, is low and covered with trees.

Mangur, the north-eastern and largest, $1\frac{1}{4}$ miles long and nearly one mile wide, is low, and lies N.E. by N. from Fadoh island.

Fadoh island, the southernmost, is about one mile in diameter, and 394 feet high; this island appears to be inhabited.

TIANDU, or Tajando, ISLANDS.—This group consists of three large and four small islands with a few outlying rocks. They lie in a N.E. by N. and S.W. by S. direction, and extend 19 miles in length, and about 8 miles in width. The south-westernmost island, Taam, is 527 feet high and round-backed; its southern point is in lat. $5^{\circ} 46' S.$, long. $132^{\circ} 10' E.$

The other islands are low and flat, but covered with trees, and they can be seen at a distance of from 12 to 15 miles.

A reef extends for 3 miles southward from the two islets north-east of the high south-western island of the group; on the edge of this reef are some rocks which are always above water. No other dangers are visible, but vessels should not venture among the islands.

Dangers.—The following shoals lie off the northern end of Tiandu, the northern island, situated from Tajando point:—Huisman rock, $5\frac{1}{4}$ miles N.W. by W. $\frac{3}{4}$ W.; Telegraaf rock, 5 miles N.E. $\frac{3}{4}$ E.; and Rembang shoal, 10 miles N.E. $\frac{3}{4}$ N. The two former are covered by less than one fathom water; the least depth found on Rembang is 15 fathoms, but there is probably much less as there are heavy overfalls over it. The position of Telegraaf rock, and of Rembang are doubtful. Within the triangle formed by these three shoals, there is reported to be a wide area containing dangerous ground.

KÉ or EWAF ISLANDS consist of the large island of Great Ké, the island Nuhu Roa which includes Ké-Dulan, and a number of islets, lying about 75 miles S.E. by E. of the Matabela islands and about 70 miles from the coast of New Guinea. The islands are almost entirely formed of coralline limestone, clothed with magnificent forests which contain an abundance of fine timber trees, some of which are said to be superior to the best Indian teak. The islands are all, with the exception of Great Ké, comparatively low, and most of them are encircled by

See charts, Nos. 9426 [2,558] and 2,264 [2,573].

extensive shoals. The inhabitants, for the most part true Papuans, are famous boat-builders, but the islands are little cultivated, and the only trade is in cocoanut oil.

A German company erected saw-mills on Ké-Dulan island, near Tual, in 1883.

GREAT KÉ, the easternmost island, is about 48 miles long N.N.E., and S.S.W., and from 3 to 6 miles broad. The whole of it is mountainous, the range traversing its centre and sloping down on either side, the highest peak, mount Daab, near the middle of the island, being 2,480 feet high. The north peak is bluff and readily distinguished; its extreme, cape Borang, is in lat. $5^{\circ} 15' S.$, long. $133^{\circ} 8' E.$ On the east and west sides of the point are small bays in which huts may be seen, and in the western of them anchorage may be found; eastward of cape Borang, the coast reef projects out to the distance of half a mile.

The north-east point lies S.E. $\frac{1}{2}$ S. from cape Borang, and from it the coast line turns south-south-westward 19 miles to Wahadan point; and then after curving a little to the westward continues in the same direction (S.S.W.) to Wednar point, the south extreme of Great Ké. This coast is clean and steep-to with no off-lying dangers.

The north-west point of the island is W. by S. $\frac{1}{2}$ S. 2 miles from the north point, and there is a detached rock about 35 feet high off it.

The western side of the island trends nearly straight from its northern end in a S.S.W. direction for 23 miles, the coast line then forms a bay, with the island of Nuhu Jaan lying off its western point. This bay, about $1\frac{1}{2}$ miles in length and width, affords anchorage in a depth of 14 fathoms off the trading station of Ellat, with shelter from all but northerly winds; the shore reef on the east side extends out about half a mile, and there are several detached rocky patches in the bay, which are said to be marked by beacons. From Nuhu Jaan island the coast of Great Ké again trends S.S.W. to its south extreme, but the outline is less regular. Off the trading station of Feer, about 3 miles from Wednar point, there is anchorage in a depth of 20 fathoms at the distance of about half a mile from the shore.

Shoals.—Several detached shoals lie off the middle of the west coast of Great Ké at about 2 miles from the shore, all of which appear to be steep-to. Mituwat, the northernmost shoal, $1\frac{1}{2}$ miles long N.N.E. and S.S.W. and half a mile wide, dries in the middle part of its eastern side; its centre lies with the north-west extreme of Great Ké bearing N.N.E. $\frac{1}{4}$ E., distant 14 miles, and north point of Ké-Dulan, W. by S. Mitduan, of similar shape and somewhat larger, is a rocky shoal with less than one fathom water over its middle part, lying half a mile southward of Mituwat. Mitnaloa is a shoal three-quarters of a mile in extent, covered by $1\frac{1}{2}$ fathoms, that lies $1\frac{1}{2}$ miles north of Nuhu Jaan island, and in the

approach to the anchorage off Ellat. There are three other patches situated about 7 miles to the southward of Nuhu Jaan, the outermost of which lies $1\frac{1}{2}$ miles from the coast.

NUHU ROA, including Ké-Dulan the north-eastern and smaller portion of it, is $26\frac{1}{2}$ miles long in a N. by E. and S. by W. direction, and from 7 to 11 miles in width; it is of irregular outline with many deep indentations, and several islands lie close to its shore of which in places they almost form a part. The island is covered with trees, and is generally low, though there are a few moderate elevations. The east side runs fairly straight, and is fringed by reef to the distance of about half a mile; a narrow detached reef, 2 miles in length, lies southward of the entrance to Rosenberg strait, $1\frac{1}{2}$ miles from, and parallel to Daar or Papua island. There are small coral patches at $1\frac{1}{2}$ miles northward, and at $1\frac{1}{2}$ miles and $3\frac{1}{2}$ miles southward from the above reef, lying about $1\frac{1}{2}$ miles from the island shore.

Mitroa shoal, with a depth of $4\frac{1}{2}$ fathoms, and probably less water to the southward of it, lies $2\frac{1}{2}$ miles off the south end of Nuhu Roa, S.E. $\frac{1}{2}$ S. from Doan point. A shoal, position doubtful, is charted as being situated 10 miles S.W. $\frac{1}{4}$ W. of Doan point.

West coast.—Ngidiun point, the north-west extreme of Nuhu Roa, is a narrow well-defined projection formed by a hill 244 feet in height; the islands Godan and Er, encircled by reefs, lie off the point, and with a detached reef outside them extend 5 miles north-westward from it. A mass of islands and reefs, some of the former about 250 feet high, lie off the west coast of Nuhu Roa, extending out from its shore to the distance of from 7 to 13 miles. Ké-Tanimbar, the south-western island, $3\frac{1}{2}$ miles long north-east and south-west, is surrounded by a broad reef, and has a hill 77 feet in height at its south-west end; it is situated with its south extreme W.S.W. 16 miles from Doan point. Many of the islands are inhabited, and there are numerous villages along the shore of Nuhu Roa.

Ké-Dulan island, forming the north-east portion of two islands separated by a very narrow strait, and covered by the general name of Nuhu Roa, is low, but well supplied with water and excellent timber. A shoal extends three-quarters of a mile from Serbat point, the north extreme of the island, with a 2-fathoms patch close outside it. At the distance of $2\frac{1}{2}$ miles N. by E. $\frac{1}{4}$ E. from Serbat point lies Tegal shoal, about half a mile in extent, and with a depth of 7 to 9 fathoms over it; this shoal lies on the eastern side of the fairway to the anchorages of Ké-Dulan. Tamedaan is a native village at about half a mile to the south-westward of Serbat point, off which there is anchorage in a depth of 14 fathoms, at about half a mile from the shore, sheltered from both monsoons.

See chart, No. 2,264 [2,573], and plan, No. 1,460 [2,575].

Ké-Dulan harbour is not readily distinguished from the north-eastward, but the following marks are useful when approaching from that direction :—The eastern point of Nuhu Roa; Gelanit hill, 348 feet high, at the northern end of the western part of Nuhu Roa; the little wooded islet Kran, lying close southward of Ubur island; and Lobi islet, on the shore of Ké-Dulan eastward of the north end of Ubur.

Ké-Dulan, situated near the shore, at $2\frac{1}{2}$ miles to the south-westward of Tamedaan, is the chief town and trading place of the island, and is frequented by proas from Makassar and Banda. The roadstead is well sheltered in both monsoons, but the water is rather deep for anchorage. A jetty, built of loose coral rock, reaches from the front of the town out to the edge of the shoal water.

Anchorage.—The first anchorage of the *Challenger* was off the village of Tamedaan, on the north point of the harbour, with Serbat point bearing E. $\frac{3}{4}$ S., and Kran islet S.S.W. $\frac{3}{4}$ W. The second anchorage was in a depth of 19 fathoms, off Ké-Dulan village, one quarter of a mile from the shore, and about a cable from the edge of the shoal water, with the mosque at Ké-Dulan bearing East, and Lobi rock S.S.W. $\frac{3}{4}$ W.

Tual harbour situated about $4\frac{1}{2}$ miles to the southward of Ké-Dulan village, on the west side of Ké-Dulan island, is a capacious and well-sheltered anchorage, formed by Ké-Dulan, Fair, and Ubur islands; the best anchorage is off Tual village, in a depth of 7 to 11 fathoms, good holding ground, with the point westward of Tual bearing S. by E. $\frac{1}{4}$ E.

DIRECTIONS.—Vessels entering Tual harbour from the northward should steer in with Gelanit hill, almost in line with Kran islet bearing S.W. $\frac{3}{4}$ S. until abreast of Lobi islet; when, the beacons marking the reefs being seen, shape course to pass between them, remembering that the easterly beacon stands on the middle of the reef, not on its edge. The mosque at Tual open of the land northward of the town, clears the eastern reef.

Supplies.—The forests produce timber of many different kinds, some excellent for ship-building. Coconut oil is the chief export. Water, pigs, and fowls may be procured at Ké-Dulan in exchange for muskets, powder, hard-ware, and coarse-cloth.

Tides.—One day's observations (September 25th, H.M.S. *Challenger*), at full moon, gave the time of high water, full and change, at Ké-Dulan harbour at 1h. 25m. Springs rise 7 feet.

Weather.—The same report as to the winds and weather was given at Ké-Dulan, as at the Aru islands.

Mr. Wallace says :—“ In Timor Laut and the Ké islands, a moister climate prevails than in Timor to the westward, the south-east winds

See plan of Ké-Dulan harbour, No. 1,460 [2,375].

blowing from the Pacific ocean through Torres strait, and as a consequence every rocky islet is clothed with verdure to its summit."

Du Roa strait.—H.M.S. *Challenger* passed out to the westward from Ké-Dulan by the deep channel between Dulan-Laut and the islands of Ubur and Krusut, and then proceeded on between Ngidiun point and Godan island; this passage is about half a mile wide between the reefs on either side.

Rumadan is a low wooded island divided in the middle and forming two at high water, lying north-westward of the north point of Ké-Dulan island, and about $1\frac{1}{2}$ miles northward of Dulan-Laut. Reefs, about $1\frac{1}{2}$ miles in width, extend $2\frac{1}{4}$ miles north-eastward and 3 miles westward from Rumadan island. The islet Dranan lies half a mile off the south shore of Rumadan.

Baer (155 feet high) and Maas are islands lying about 3 miles north-westward of the northern end of Rumadan. A large reef extends eastward and southward from Maas to the distance of $2\frac{1}{2}$ miles, with the islet Sua at its south extreme; and a detached reef, one mile in extent, lies between Baer and the north-west end of the reef projecting westward from Rumadan. Datu reef, about half a mile in extent, lies half a mile northward of the north end of Maas.

Batavier reef, of coral and rock, reported to be $6\frac{1}{2}$ cables long north-east and south-west, and 4 cables wide is indicated by discoloured water; the least depth obtained on it was $4\frac{1}{2}$ fathoms. It lies with the north point of Rumadan island bearing S. $\frac{1}{4}$ E., distant about $4\frac{1}{2}$ miles, and north extreme of Maas island S.W. $\frac{3}{4}$ W.

Van Speyk reef, reported to lie about $5\frac{1}{2}$ miles northward of Rumadan island, and to be about 3 cables long south-east and north-west, is visible from the discolouration of the water and rippling of the tide, and has probably less than 2 fathoms water over it. Its approximate position is $1\frac{1}{4}$ miles north-westward of Batavier reef, but the charted position of both these reefs is doubtful. Dangerous ground is said to lie between these reefs, and Datu reef.

Ender rock is a coral patch about half a mile in extent, with a depth of $3\frac{3}{4}$ fathoms upon it, lying 6 miles N. by W. $\frac{1}{4}$ W. from the north extreme of Maas island.

The ARU ISLANDS, which lie about 65 miles east of Ké islands and 60 miles from the nearest coast of New Guinea, consist of five principal islands and numerous smaller ones, extending 107 miles north and south, and 50 miles east and west. The most important islands are Warialau, Kola, Wokam, Kobrur, Maikur, and Trangan. They are separated from each other by narrow channels or *sungi*, which are only

See charts, Nos. 2,264 [2,575] and 942b [2,558].

navigable for craft of very light draught. All the islands are of coralline limestone, the height nowhere exceeding 300 feet above the sea, and they are everywhere clothed with virgin forest. The inhabitants are true Papuans of various tribes, but generally inferior in physique to the Ké Papuans or the *Mafors* of Geelvink bay. Some native teachers from Amboina, established in two or three of the coast villages, have partially converted and civilised these people, but the majority of them are in a state of utter barbarism.

The southern and south-western coasts of the group were surveyed in 1885 by H.M.S. *Flying Fish*. From the south-west point of Trangan, shoals extend out to a distance of 13 miles from the shore; outside these shoals the depth increases irregularly, and 20 fathoms will generally be found at a distance of about 20 miles from shore. The western shores of the group are fairly clean except off the north-west point of Trangan, which is bordered by a reef 3 miles broad. The northern islands are also fringed by reefs which extend 2 miles out. The reefs off the eastern coast reach far out, and vessels should not approach these shores within 12 miles, at which distance depths of 5 to 10 fathoms over coral bottom will be found; thence seaward the depth gradually increases.

The principal port in the islands is Dobbo, on the western side of Wokam island. The town of Dobbo is the great commercial centre for the trade of all the islands between Timor and New Guinea, as well as for the south-west coasts of the latter island. It is visited during the trading season, January to August, by Bugis, Ceramese, Chinese, and other traders, numbering in the height of the season about 1,000 people. Between October and January all the smaller praus are engaged in pearl-shell and trepang fishing off the eastern coast. The annual value of the exports, which comprise pearl-shell, tortoise-shell, trepang and birds of Paradise, is about 18,000*l*. The Government is represented by a Dutch *posthouder* resident at Dobbo, and a commissioner from Banda, who makes a visit of a few days once a year. There is also a *posthouder* at Longar in Barkai, one of the southern islands.

Winds and Weather.—From native report, the south-east monsoon commences at the Aru islands about the beginning of May, and lasts until the end of August or middle of September; light winds then prevail to the middle or end of November, when the north-west monsoon sets in. Apparently the south-east monsoon lasts longer to the southward of the group than to the northward, and land and sea breezes prevail in Dobbo in November.

The rainy season occurs in the north-west monsoon, but rain falls every day during the south-east monsoon. The finest months are September and October, when but little rain falls. In October however, during the survey of the *Flying Fish*, the land was always enveloped in thick haze, and

seldom visible more than 2 miles off. In November the haze was not so thick as in October and a few clear days were experienced.

The mean temperature during the two months was 82° Fahrenheit.

Tidal streams.—The flood stream sets S.E. along the north coast of the Aru islands, and S.S.E. along the east coast as far as Meriri, where it meets the flood coming from the southward. Where the streams meet on the east coast the streams become circular, setting toward the shore when the tide is rising, and away from it when falling. The greatest rate observed was on the north and south coasts, where it ran 2 knots.

Warialau, the northernmost island, is covered with high trees, with a village of the same name on the south-west point. A reef which partly dries extends $1\frac{1}{2}$ miles from the north shore of Warialau, upon which stands Ngoba islet thickly overgrown with trees. Reefs also extend eastward as far as the islet Jedan, and one mile east of Jedan there is a sand-bank which extends 2 miles eastward, and dries at low water. Southward of the Jedan islands there is a navigable channel, with depths of 5 to 12 fathoms, leading up to the group of islands lying south-east of Warialau, and to Kola-Watu; the entrance may be reached by steering in with the south point of Latur island on with the middle of Surat islet, bearing W. $\frac{3}{4}$ N. The northern approach, between the Jedan islands and Warialau, is foul.

Westward from Warialau the coast reef extends $1\frac{1}{2}$ miles. Toba island, west of Warialau is low and narrow with a clump of trees on its south-east part; from its outer side a reef projects 4 miles to the westward.

Kola island is low and wooded; the northern point may be distinguished by two small clumps of trees which appear at a distance like hills. Buar island, to the west of this point, is bordered by a reef which extends one mile west and south-west from it. Kola village, built upon a rock, lies on a small creek on the north side of the island, and there is a pier here for small vessels to go alongside; the western approach to Kola-Watu is deep and clear.

The eastern coast of Kola is rocky and covered with dense vegetation; the villages of Marlasi and Masidan stand upon it, and like the other villages on these islands, appear from the offing as light red patches. Banks of sand and coral, which partly dry, extend seaward 5 miles from Kulur, and east-south-eastward $8\frac{1}{2}$ miles from Binaar island; the small islets Konan and Arar Kula stand on the southern part of these banks, the former being thickly wooded.

Wasir island, the north-westernmost of the Aru islands, is thickly wooded; the west coast is said to be clean, with the exception of a small rocky islet off it a quarter of a mile from the shore. The north shore has

a reef extending one mile from it, and the east coast is bordered by a sand-bank, which at one place projects half a mile from the shore. The village is on this side of the island. The south point is rocky and a reef projects nearly half a mile from it.

There is good anchorage in the channel between Wasir and Ujir, in a depth of from 9 to 19 fathoms, sandy bottom.

Danger.—Java reef lies $3\frac{1}{2}$ miles northward of the north-west extreme of Wasir island, in lat. $5^{\circ} 26'$ S., long. $134^{\circ} 14'$ E. approximately.

Ujir islet lies S.E. of Wasir, in a bight of the coast of the main island Wokam. The west point is fronted by a sand-bank which dries out three-quarters of a mile at low water. A bank of 3 fathoms projects from the north point into the strait between Ujir and Wasir. The village Ujir lies on the north-west shore. On the east side of Ujir there is a passage 2 miles wide, but it is not navigable on account of the reefs in it. A reef projects northward 2 miles from the north-west coast of Ujir, and one mile westward from its south-west extreme.

Wokam island.—The part of this island of which the most is known to Europeans, is the projecting western peninsula which forms the northern side of Dobbo harbour. On the outer coast of this peninsula are the villages Wokam and Samang. The coast reef is here one-third of a mile wide, but from Malakafani, the western point of the island and the northern point of entrance to Dobbo harbour, it projects a mile to the west and south-west. Soundings deepen rapidly off this part; at 3 miles from the shore the depth is 20 fathoms, and at the distance of 7 miles the *Challenger* found 800 fathoms.

A number of small islands, with outlying sandbanks, stretch along the whole of the east coast of Wokam, and extend out from it to the distance of 7 to 11 miles. Many of these islands are wooded and inhabited, the passages amongst them, and between the banks, are used by native praus. Great Karaweira, 7 miles eastward of the south-east point of Wokam is a thickly-wooded islet, the tree-tops reaching a height of 243 feet, the greatest elevation known on this side of the Aru group.

Wammer island is roughly square-sided, and surrounded by a reef generally about half a mile wide. The north-west point, Ular, has a huge rock close to it, and on the rock a single tree, which makes a good mark for the entrance to Dobbo harbour. There are also two rocks on the reef off the west coast, the largest of these has two trees on it; behind this rock, one mile south of Ular point, is the village Wangit. Off the north side of the island there are three rocky patches; one, of 3 fathoms, lies N.W. 6 cables from the rock off Ular point; another, of $5\frac{1}{2}$ fathoms, lies N. by E. 6 cables from the above rock; and the third, of $3\frac{1}{2}$ fathoms, lies

with the same rock bearing W. $\frac{1}{2}$ S., and the end of Dobbo spit E.S.E. The town of Dobbo stands on the north-east point of Wammer; a sand spit projects half a mile out from this point..

The south-eastern and south-western points of Wammer are bordered by a reef to the distance of about one mile. The little islet Meirang lies 3 miles east of the south-east point of Wammer; as shoals extend $1\frac{1}{2}$ miles westward from this islet towards Wammer, vessels using the passage between the two should keep in mid-channel, where they will find a depth of 4 fathoms. A shoal, with a depth of 3 fathoms, lies 2 miles South from Karkeli point, in the approach to the east channel. The village of Farulei is situated on the east coast of Wammer.

DOBBO HARBOUR, formed by the channel between Wammer island and the peninsula of Wokam island, affords secure anchorage in both monsoons. The entrance is 2 miles wide between points Ular in Wammer and Malakafani in Wokam, but the navigable channel is contracted to a breadth of only one mile by the shoal water extending from both shores. Within this the channel gradually narrows to a width of 4 cables off the settlement, with depths of 6 to 16 fathoms near the edges of the shoals, which show very distinctly, and are marked by poles or fishing-stakes. The central part of the channel has not been sounded out; the two shoals of $5\frac{1}{2}$ fathoms and $3\frac{1}{2}$ fathoms above mentioned were found in it in 1875; the passage to the north of them is safest.

The town of Dobbo, the chief resort of the traders, stands $2\frac{1}{2}$ miles within the entrance of the harbour on a sandy spit projecting from the north-east point of Wammer. The native praus haul up on the east or west side of this spit, according to season; the north point of it is steep-to.

Anchorage.—There is good anchorage in 16 fathoms with the end of the spit bearing S.S.E., and the rock off Ular point W. $\frac{1}{2}$ N.; but the trading steamers anchor during the south-east monsoon close to the reef eastward of the spit, for the convenience of unloading, and during the north-west monsoon they anchor to the westward of the spit.

Supplies.—Pigs, fowls, fish and fruit are obtainable in small quantities, but no other supplies; nor can water be procured. The coin used is the Dutch dollar at 4s. 2d., and the guilder at 1s. 8d.

Coal.—The Dutch Government have a depôt of 300 tons of English coal in a shed at the end of the spit. This coal is intended only for the use of the gunboats on the station, and can only be obtained by order of the Resident at Amboina. There are no facilities for shipping it, but praus of $1\frac{1}{2}$ tons burden can be hired for 2s. 6d. a day, and coolies can be obtained at a day's notice for 1s. a day. The price of coal is £3 2s. 6d. a ton.

Tides.—From observations obtained at Dobbo (in September) it would appear to be high water, full and change, at about 2h. 30m. Springs rise 6 feet, but the time of high water is uncertain. In the *Moluksche Archipel* high water is given at 1h. 45m.

The flood stream at Dobbo harbour comes in from the westward, and the ebb stream from the eastward. In the south-east monsoon the flood is weak, but the ebb runs at the rate of from one to $1\frac{1}{2}$ knots an hour.

In the offing the flood stream sets to the S.S.E. and the ebb to the N.N.W.

Directions.—In making for Dobbo harbour from the southward, vessels usually sight the island of Babi, and when 4 or 5 miles west of it may steer a N.N.E. course for Wangit village, where a pilot can be obtained for the harbour. In approaching from the northward, the entrance is easily made out, being the third large opening south of Wasir island. When about to enter the harbour the coal shed at the end of the spit should be brought to bear S.E. by E. $\frac{1}{2}$ E., and steered for on that bearing, which will lead in clear of danger.

Attention must be paid to the tides at the entrance; the flood stream setting on to the Wammer reef, and the ebb to the Wokam reef; within, the streams set in the direction of the channel.

Babi islet, midway between Wammer and Maikur is flat and thickly wooded; a reef surrounds it which the chart shows to extend half a mile to the westward, southward, and eastward. The channels between Wammer and Babi, and between Babi and Maikur are each of them 3 miles wide.

Maikur island, also flat and thickly wooded, is reported by Lieutenant Phaff, of the Dutch navy, to be long and narrow, extending N.W. and S.E., and the south-eastern end to be separated from Koba island by a narrow strait only. Lieutenant Phaff also says that the strait which separates Maikur from Kobrur island is known as the Koba Sungi, and that between Maikur and Trangan as the Maikur Sungi. The west coast of Maikur is fronted by shallow water to about 2 miles from the shore, at which distance the depth is $4\frac{1}{2}$ fathoms; from thence to the westward it deepens rapidly. A coral reef of some extent covered by $1\frac{1}{2}$ fathoms, is said to lie 3 miles N.W. from Fatujuring point, the north-west point of the island. The principle village stands on the south-west point; it consists of about a dozen houses, and possesses a government school. The *Flying Fish* anchored off this village in $5\frac{1}{2}$ fathoms with the extremes of Maikur bearing N. $\frac{1}{2}$ E. and E. $\frac{1}{2}$ S. In the great bay between the north end of Maikur and the western pensinsula of Wokam the depth is from 4 to 7 fathoms, increasing to 13 fathoms within the mouth of Wanumbai strait.

Kobrur island, south of Wokam, is separated from that island by a narrow channel, named Wanumbai strait, the western entrance of which

See plan, No. 1,460 [2,575], and chart, No. 470 [2,574].

bears E. $\frac{1}{4}$ S. from the northern point of Maikur. There is a small rocky islet on the southern side of this entrance, and a reef projects three-quarters of a mile out from the northern point of it. This strait is the main channel of communication for native craft between the east and west coasts, and Wanumbai village, standing on the bank of a fresh water stream which falls into the strait 3 miles within the western entrance, is the central point of trade of the interior. The strait is a quarter of a mile wide, and carries a depth of 4 to 5 fathoms in the centre as far as the village.

TRANGAN is the southernmost of the large islands composing the main body of the Aru group. Its northern part is flat and wooded; the trees have an even height of about 100 feet above the sea, and come to an abrupt termination at the outer extremity of the north-west point, which may thus be easily recognised. The point is bordered by a reef about 2 miles wide; there is an apparent bluff standing out from the dead level of the sea, about 5 miles southward of the point, and this is the only prominent object northward of North hill.

Batavia reef, with a least depth of $2\frac{1}{2}$ fathoms over it, lies S.S.W. distant 8 miles from the north-west extreme of Trangan island, and 4 miles from the coast.

Neiguli, where the *Flying Fish* commenced her survey, is a fishing village on the west coast, in lat. $6^{\circ} 37'$ S., about a mile to the northward of some large white boulders. At 2 miles S.E. of the village is North hill, a flat-topped, wooded hill, 282 feet high, the best mark for this part of the coast. There is good anchorage during the south-east monsoon in smooth water one mile off Neiguli, in a depth of 6 or 7 fathoms, sand. The flood-stream in the offing here runs to the southward, and the ebb to N.N.W., the streams turning $1\frac{1}{2}$ hours after high and low water by the shore. From Neiguli the coast trends nearly S. by W. for 9 miles, and is low and thinly wooded as far as a point with a large black rock on it; it then trends S.S.E. for $3\frac{1}{2}$ miles to the south-west point.

The south-west point of Trangan is a bluff point 213 feet high, with a very remarkable white square patch on it; the native name is Tanjong Bain. At $1\frac{1}{4}$ miles N.N.E. of the white patch is Bain village, on a hill 226 feet high; and a range of low hills extends for 3 miles further in the same direction. Flat hill, 300 feet high and wooded, rises $3\frac{1}{2}$ miles east of the white patch. This hill is the highest in Trangan and is very conspicuous from the southward, but not so from any other direction. From the south-west point the coast trends east for $3\frac{1}{2}$ miles as far as the mouth of a creek, and then, turning south-east, forms a bend which is 6 miles across.

See chart, No. 470 [2,574].

The south point of Trangan consists of low sandstone cliffs 20 to 30 feet high, with casuarina trees to the height of 130 feet above the sea. Off the point is a small point, with a few tall casuarinas, and to the southward, again, is a pinnacle rock 37 feet high, named White rock or Batu Goyang.

The south-east coast of Trangan is low, showing conspicuous red and white cliffs 30 to 60 feet high, with a few clumps of trees on them and grassy undulating hills behind. The town of Oud Krei on this coast is the principal trading place of the southern island. The space between this coast and the islands to the eastward has not been explored; it is reported to be full of reefs. The chart shows a channel leading to Oud Krei, which passes close westward of Jei island distant about 12 miles to the S.S.E.

Blackburne shoals, off the south-west point of Trangan, consist of several detached shoals of one to 3 fathoms, occasionally breaking on the shallowest parts, and having deep water between them. They extend 10 miles N.N.W. and S.S.E. with other shoals between them and the south point of Trangan. These shoals are too numerous to be described in detail; their position and form can best be seen by reference to the chart, and as the land is frequently obscured, and even when not hidden has few well defined points, no marks can be given to clear them; they should therefore be given a wide berth. The tides are very strong here, and when running against the wind raise a considerable sea, it is not unlikely therefore, that the shoals shift from time to time.

Though irregular, the soundings deepen towards the southward and westward, and as a rule the 20-fathoms line will be found at a distance of 20 miles from the south-west point of Trangan.

Maar island, on the southern end of an extensive reef between Trangan and Barkai (Workai) islands, is well wooded and 90 feet high to the tops of the trees; there is a sand-cay, always dry, at $1\frac{1}{4}$ miles N. by W. $\frac{1}{4}$ W. from the north point of Maar. The small wooded island Babi or Wolil lies 5 miles N.W. by N. of Maar, and stands on the same reef. The space between Maar and the south point of Trangan has not been surveyed, but breakers have been seen there, and it is reported to be full of shoals. The channel between Maar and Jei is used by praus.

Jei island, separated from Maar by a narrow channel, is $2\frac{1}{2}$ miles long east and west, 126 feet high, and wooded; a narrow reef fringes the island, from which shoal water extends for nearly three miles from the southern side. There is a lagoon in the north-west side of the island, where the natives catch turtle. The *Flying Fish* anchored off the west side of Jei in a depth of 6 fathoms, out of the tide and swell.

Tides.—It is high water, full and change, at Jei island at 4h. 20m.; springs rise 5 feet, neaps 3 feet. The streams are felt at the distance of

See chart, No. 470 [2,574].

15 to 20 miles from the coast, flood setting to the east and ebb to the west; commencing between one and two hours after high and low water by the shore. The maximum rate of the flood stream is 2 knots an hour.

Ennu, the southernmost of the islands is nearly 4 miles in length, east and west, with a narrow coral reef around it. The island is wooded and rises on its north-west side to a height of 100 feet. It is uninhabited, there being no good water on it. The south-east point is low, and ends in a spit of broken coral, off which there is a tide-race. Near the south-west point is a conspicuous group of casuarina trees; the *Flying Fish* observation spot was on the sandy spit here, in lat. $7^{\circ} 5' 25''$ S., and long. $134^{\circ} 28' 45''$ E.

At 2 miles south of this point there is a shoal of 3 fathoms, and at the distance of 3 and 5 miles westward of the same point other shoals of 4 and $3\frac{1}{2}$ fathoms respectively. Good anchorage will be found in a depth of 6 or 7 fathoms, coral, with the north extreme of Ennu bearing East and the south-west point S. by E.

Karang island, 9 miles E.N.E. of Ennu, with depths of 7 to 10 fathoms between them, is circular, one mile in diameter, and surrounded by a coral reef which extends three-quarters of a mile to the south-west. The island is low and thickly wooded, the trees showing a height of some 100 feet. On the north-west side there is a conspicuous tree, taller than the rest.

Banda rock, about one cable in diameter, and with a depth of 20 feet over it, lies $4\frac{1}{2}$ miles N. $\frac{1}{4}$ E. of the north-east point of Karang; from the rock the south-west extreme of Jaudin island bears W. by N. $\frac{1}{2}$ N.

Jaudin (Judei) island, $2\frac{1}{2}$ miles E.N.E. from Maar, is 6 miles long N.E. by E. $\frac{1}{4}$ E. and S.W. by W. $\frac{1}{2}$ W., and covered with casuarina trees, about 150 feet high; a clump of these about the middle of the island is rather remarkable, standing out as a square block. A coral reef with a dry sand-cay on it projects one mile out from the south-west point, and the south shore is foul to the distance of a mile. Judei lies on the southern edge of a large reef extending southward from Barkai, and between this reef and that north of Maar there is a channel leading towards the village of Longar, on the south point of Barkai. Several low wooded islets extend for $4\frac{1}{2}$ miles east of Judei, and one mile further eastward the reef turns N.N.E. and is fairly steep-to. There is anchorage off the north-west point of Jaudin in a depth of 7 to 9 fathoms, from whence to Longar the channel between the reefs is said to be intricate with irregular depths of 2 to 13 fathoms.

Barkai (Workai) is a large island lying 8 miles eastward of the eastern end of Trangan island, the space between, in which are Fenjurin, Bari, and several other islands, being unsurveyed. Barkai is $12\frac{1}{2}$ miles

long N.N.E. and S.S.W., and 6 miles wide; it is covered generally with rather high trees, but affords few salient features. The south-east coast of Barkai is low, wooded, and fronted by a coral reef which projects 8 miles eastward, and extends 8 miles south, including the Jin (Jaudin) islands; this reef dries in places and there is a passage through it from the eastward, named Walorjin, which passes close to the south-east point of Barkai. In this locality are the best fishing grounds for pearl-shell and trepang. The south point of the island is a low white cliff, on the summit of which is a conspicuous kelapa tree rising above the others, which forms a good landmark. Under the cliff are situated the villages of Baimun and Longar, the latter being the residence of the Dutch *posthouder* for the southern district.

The north-east coast of Barkai, of which Turtur Juring may be considered the extreme, is also bordered by an extensive reef which extends 3 miles eastward embracing Bambu and four smaller islets; and also projects to a distance of 5 miles, with a width of about 4 miles, in a S.S.E. direction from the east point of Turtur Juring. Upon the southern part of the reef stand the sandy Kultubai islets, westward of which there is a broad shoal indentation in the reef leading up towards the villages of Gomo Gomo and Masian.

Barakan is about 5 miles long N.N.E. and S.S.W.; the north-east point of this island is rocky and densely wooded. A reef, with the small round islet Wamai on it, projects fully 2 miles out from the south-east point. Motjam, Lardubui, and several smaller islets lie off the north-west point of Barakan.

Baun island, circular in form, with a diameter of about 8 miles, lies off the south-east end of Maikun island, close westward of Barakan and immediately northward of Barkai; from all three islands it is separated by narrow channels.

Penambulai and Jambuai are the names of the northern and southern parts of an island, 12 miles long north and south, and 4 miles wide, lying N.N.E. of Barakan, and separated from it by a narrow channel. It is thickly wooded and sandy, except near the rocky south-east point; Uafu Fenjoring, the east point and the eastern extreme of the Aru islands, is well marked by its high trees and sandy shore. Near Rabal at about the middle of the east coast the tree-tops are elevated 166 feet above the sea. The east coast is fringed by reef, which from the north-east point projects north-eastward $1\frac{1}{2}$ miles, with shoal patches lying one mile further north-east, and a shallow tongue continuing in the same direction to a distance of nearly 5 miles from the shore. Along the east coast generally the shore reef is about a mile in width; two miles southward of Uafu Fenjoring point, there are outlying patches distant

about 2 miles from the shore. Westward of this island lie Lelamtuti, Wolwa, and Mimien islands; northward of them all there is a channel leading through much shoal ground, up to the eastern entrance of Sungai Barkai or Koba.

Meriri islands.—This group consists of Meriri and Leer, and several smaller islands of which Lola is the most southerly; they lie in a N.N.E. and S.S.W. direction, and are in great part overgrown with kelapa trees, those in Meriri the northern island being 167 feet high. The islands are noticeable by having several light grey boulders on the sandy shore. The group stands on sandbanks which stretch out from the islands $1\frac{1}{2}$ miles northward and to the east, and for 2 miles in a southerly direction; they lie 5 miles off the eastern coast of Kobrau island, the intervening space being almost entirely occupied by sandbanks and reefs.

The soundings gradually decrease on approaching these islands from the eastward; there is anchorage off the village of Meriri in a depth of 5 fathoms, sand, $1\frac{1}{4}$ miles off shore, and in 4 fathoms with the village bearing W. by S., distant 6 cables.

Between the Meriri group and the Karaweira islands lying about 7 miles northward, and westward towards and up to the Kobrau coast, there are many sandbanks, shoals, and islets (too numerous to describe), with channels in some places leading up to the eastern entrance of Sungai Wanumbai or Watulei, the passage which separates Kobrau and Wokam islands.

The Karaweira islands (including the Jursian islands close off the south-east coast of Wokam) are a group stretching about 12 miles in a north and south direction, and lie on an extensive sandbank or reef, which, with detached shoal patches off it extends out from the coast to a distance of 11 miles. Dorlau, the southernmost of these, is a small thickly wooded islet with two high tree-tops; from it the bank extends eastward $2\frac{1}{2}$ miles where there is a black patch of coral that dries at low water. Great Karaweira, 4 miles north of Dorlau, is about three-quarters of a mile in diameter; the island is rocky and thickly wooded, the tops of the trees being 243 feet above the sea.

The Watulei group, consisting of Tabar, Watulei, Kuniul, Aduar, and other smaller islands and islets, stretch northward from the Karaweira islands along the Wokam coast, the reef or sandbank upon which they stand extending out about 6 miles seaward. The islands are thickly wooded; the tree tops on Watulei are 152 feet high. Mentai islet at the south-east end of the group, and about one mile within the edge of the bank, is a rock overgrown with vegetation which has the appearance of a plume. There are channels through the reefs and banks all along this

See chart, No. 470 [2,574].

coast used by the native praus; the banks can be safely approached by the lead, and there is anchorage off the same in a moderate depth of water.

From the Watulei group northwards, along the remaining part of the east side of the Aru islands, reefs and sandbanks extend out to the distance of 7 or 8 miles from the coast. Arar Kula and Konan islands, the latter thickly wooded, stand upon the banks lying off the entrance to Sisir Watu, the channel separating Wokam and Kola islands.

SERWATTI ISLANDS include the long chain of islands which extend from the east end of Timor towards the Aru islands, and which terminate in the Tenimber or Timor Laut group. These islands may be said to be divided into two nearly parallel chains which approach each other as they near the coast of Timor. In the northern chain the principal islands are Wetta, Roma, Damma, Tau, Nila, and Serna, while the southern chain comprises Kissa, Letti, Moa, Lakor, Sermatan, and Babar. The population of the group was estimated in 1881 at 47,000 inhabitants; of this number Roma and Damma contain each respectively 1,500, Kissa 7,000, and Sermatan 3,500.

The description of the anchorages in these islands is taken principally from the voyage of the Dutch brig of war *Dourga*. Lieutenant D. H. Kolf, 1825.

Northern chain.—Wetta, the westernmost island, is lofty and well wooded, about 65 miles long E.N.E. and W.S.W., and 20 miles wide; the coasts are but little known and are given on the chart in dotted line. A portion, however, of the south coast, from the south-west point as far east as Tower hill, a distance of 20 miles, was, together with Babi island, examined by H.M.S. *Myrmidon* in 1846, and found to be steep-to and apparently free from dangers of any sort. Tower hill is 4,390 feet high. The east point of the island should not be approached too closely, as H.N.M. schooner *Janus* in 1840 reported breakers about 2 miles off the south-east part.

The only known anchorage on the coast of Wetta is in Ilwaki road on the south side of the island, where a vessel may lie fairly sheltered from the south-east winds by a point of land. There is tolerably even ground, with sandy bottom, for nearly 2 cables from the reef which borders the northern shore for three-quarters of a cable, and at the same distance from the steep-to east shore. Upon this flat there is anchorage in a depth of 30 fathoms, sand, at $1\frac{1}{4}$ cables from the reef; with a remarkable little cocoanut wood bearing E. $\frac{1}{4}$ N., and the conspicuous small hill on a point, S.E. by E. $\frac{1}{4}$ E. The Netherlands India steamers call at Ilwaki once in three months, on their way between Makassar and New Guinea.

See chart, No. 942a [2,557], and plan, No. 2,468 [2,571].

Babi or Liban island, off the south-west point of Wetta, is $5\frac{1}{2}$ miles in length north and south, by about 2 miles in breadth, and rises to a height of 1,415 feet. The channel between Babi and Wetta appears to be blocked by a coral reef which extends to a distance of 6 cables south of the south point of Babi, and then follows the western coast line to the northward, varying in width from one to 3 cables. Very good anchorage in perfectly smooth water may be had in the strength of the south-east monsoon, in a depth of 8 to 10 fathoms, a mile to the northward of the southern point of Babi. There is one village on the island, and the natives are very civil, but no supplies are procurable.

Tides.—At the above anchorage it is high water, full and change, at 1h. 30m.; springs rise 8 feet. The flood stream was observed to run to N.N.W. and the ebb to S.S.E. at the rate of $2\frac{1}{2}$ to 3 knots an hour, two or three days after springs.

Nautilus reef, lying one mile to the northward of Babi island, partly uncovers; no examination was made north of the reef, but apparently there is much foul ground off the north-west coast of Wetta between Babi and Honden island.

Roma island lying about 28 miles east of Wetta, is 12 miles long north-east and south-west, and 5 miles wide; it is of good height, with smaller islands around it. On the south-east side of Roma, immediately opposite the north end of Nusa Mitan island, lies a fine and fertile valley, through which a small river runs into Rumah Kuda bay. In the northern monsoon there is good anchorage for a vessel in the bay opposite the mouth of this river, from which abundance of wood and good water may be obtained. On all the other sides of the island the shores are steep and rocky, and beaten by a heavy surf, which renders landing extremely difficult.

The *Dourga* anchored in a depth of 7 fathoms off a sand-bank which extends half a cable to the northward of Nusa Mitan islet, lying $1\frac{1}{2}$ miles eastward of the south point of the island; there is also anchorage $1\frac{3}{4}$ cables north-westward from the north point of Nusa Mitan. A sand bank extends nearly 2 cables from the west side of the island.

The chart shows an island, Niata, 3 miles north-west of Roma, with a reef extending 3 miles northward from it. A group of five islands, Mapura, Laag, Nusa-put-puti, Pick, and a small islet, lie about 5 miles eastward of Roma.

Damma island, about 70 miles E.N.E. of Roma, is circular, 8 miles in diameter, high and mountainous, with a smoking volcano peak about 3,165 feet high on its north-east extremity. Kulewatte bay, on the eastern side, penetrates 4 miles into the land, with great depth of water and high precipitous shores. The only anchorage in it is in a depth of

See chart, No. 942a, and plans, Nos. 2,465 [2,572] and 935 [2,568].

20 fathoms, black sand and coral, $1\frac{1}{2}$ cables S.W. by S. of a large hut close to the ruined watch-house on the north side; the anchorage space is about 2 cables in extent. Reefs fill the head of the bay, and another extends one cable off-shore eastward of the watch-tower. The observation spot at the watch tower is in lat. $7^{\circ} 8' 46''$ S., long. $128^{\circ} 40' 19''$ E.

Wilhemus bay, on the north side of the island, is entirely exposed and affords very bad anchorage, a heavy sea tumbling in during both monsoons; still, the anchorage is said to be better in the south-east monsoon than that of Kulewatte. There is also anchorage off Batu Merah (literally red rock), west of Wilhemus bay, about one cable from the shore, and on the edge of the reef, in a depth of 20 fathoms, outside which position the water deepens very quickly.

A steamer of the Netherlands India Company touches at Damma periodically; see page 30.

Two small islands on one large reef, Terbang and another, are shown on the chart to lie respectively $3\frac{1}{2}$ miles S.W., and 6 miles S.W. by S. from the south point of Damma, and two other small islands appear on the chart about 13 miles W. by S. of the same point, but there is no further information about them.

Tau island, 25 miles E. by N. $\frac{1}{2}$ N. from Damma, is about 4 miles in extent, north-east and south-west, and rises to a height of 2,000 feet. It is sparsely populated.

Lieutenant Kolff reported that the channel between Tau and Nila was unsafe on account of the reefs in it, but H.N.M. brig *Meermin* in 1840 only saw current rippling; until the channel has been examined caution is recommended.

Nila island, about 18 miles E.N.E. of Tau, rises on its eastern side to a precipitous mountain 3,898 feet high. A reef with the small islet Nika on it extends $1\frac{1}{2}$ miles from the north end of Nila. There is anchorage 4 to 5 cables westward of Nika islet in a depth of 15 fathoms, sand, between the above mentioned reef and another reef lying about 3 cables west of it. To enter this anchorage steer in with the outer and larger of two small islets close under the shore bearing S. $\frac{1}{2}$ W., and anchor when the peak of Nika islet bears E. $\frac{1}{2}$ N. The natives raise hogs poultry, and also cocoanuts for sale at Babar and Bandu.

Dusborgh reef was reported in 1870 by the Dutch brig of that name as lying about 10 miles north-west of Nila island; no particulars were given.

Griffin reef, 22 miles N.E. $\frac{3}{4}$ E. of Nila, is composed of coral, and dries 6 feet, it extends three-quarters of a mile east and west, and is half a mile broad.

Serua island, about 43 miles N.E. of Nila, is a volcano rising precipitously from the sea, visible at a distance of 32 miles; the sides are

See plan, No. 2,465 [2,572], and chart, No. 942b [2,558].

too steep to afford anchorage, and the natives haul their praus up on the shore. Two islets lie off the western point. Its position has not been accurately determined.

SOUTHERN CHAIN of SERWATTI ISLANDS.—
East point of Timor.—Timor island itself is out of the scope of this work, but it is convenient to note here that the East point is high and the coast steep-to. A range of mountains from 2,653 to 3,048 feet high traverses the point not far from the coast in a N.N.E. and S.S.W. direction. The inhabitants at this part appear to be very shy.

Nusa Besi, off the east point of Timor, is a small flat uninhabited island appearing as a tongue of land before it opens from Timor. The island is circular, $2\frac{1}{2}$ miles in diameter, and wooded, the tops of the trees being 350 feet above the sea. A coral reef fringes the island, varying in width from a few yards on the western side to about 3 cables on the north and south sides. The channel between Besi and Timor is 3 to 4 cables wide and perfectly clear, carrying a depth of over 10 fathoms right through, and is very easy for a steamer to navigate. There is excellent anchorage on the north-west side of Besi, in a depth of 8 to 12 fathoms, sand, about a quarter of a mile from the shore. At springs, the tidal streams have been found to run regularly in this channel, and to attain a maximum rate of 3 to 4 knots, forming strong eddies.

Kissa island, one of the most important of the Serwatti islands, lies 17 miles N.N.W. of the east point of Timor. It is about 6 miles long north and south, by 4 miles broad, and rises on the north side to a grassy peak 808 feet above the sea. The island is fertile and well cultivated, but the shores are steep and the creeks can only be entered by praus of light draught. There is anchorage during the south-east monsoon in a bight to the northward of the south-west point, on a strip of sand and rocks, with very irregular soundings in it.

The *Nautilus* anchored in $7\frac{1}{2}$ fathoms, three-quarters of a cable from the shore, with the old Dutch fort bearing N.N.E. and the south-west point S. $\frac{3}{4}$ W., and secured to the shore by a hawser. There is a village near this anchorage, but the principal village of the island, Waurili, is about 2 miles inland up a valley. There are also villages on the east coast.

Directions.—A vessel proceeding to the anchorage on the west side of Kissa island should stand in close to the south-west point of the island, and then run along shore to the northward, anchoring close round the south-west point of the bay; it would be prudent to send a boat ahead to pick up a sandy spot. The commander of the *Myrindon* reported (1886) that this anchorage must be used with great caution, as there are patches with only 2 fathoms on them close to the outer edge of this strip, which is a solid ledge of rock, not coral.

See chart, No. 942a [2,557], and plan, No. 1,460 [2,575].

Supplies.—Water can be procured from the beach on the west side by the old Dutch fort. The chief articles of trade are sandal wood, bees-wax tortoise-shell, and trepang; the *Myrmidon's* officers saw cattle, sheep and fowls in considerable numbers, and fruit was procurable. A steamer of the Netherlands India Company visits the island periodically; see page 30.

Letti island, 23 miles N.E. by E. $\frac{1}{4}$ E. of the east point of Timor, is 8 miles long east and west, and 4 miles wide. A range of hills, rising to 1,300 feet above the sea, traverses the middle of the island from east to west. The wooded sides of these hills slope gradually to the level land near the coast, where the greater portion of the inhabitants live in villages upon the more elevated and projecting points of land. The north and west sides of the island are bordered by reefs, extending about half a mile from the shore, and the east point is also fringed by a reef.

The natives are not so civilized as those of Kissa, neither are they so prosperous. The produce is similar to that of Kissa.

Anchorage.—During the S.E. monsoon the best anchorage is on the north side of the island, off the village of Serwaru, where the fringe reef is only $1\frac{1}{2}$ cables wide, and the depth increases from 5 fathoms at the edge of the reef to 25 fathoms at half a mile from the shore. The anchorage is in a depth of 12 to 15 fathoms, with the highest mountain top in line with the church bearing S. $\frac{1}{4}$ E., and the north point of the island E. $\frac{3}{4}$ S. The church must not be mistaken for the dwelling of the Resident, situated some distance westward of it. The bottom is irregular and the holding ground indifferent. Discharge and embarkation of cargo can only be effected with high water, on account of the reef which fringes the coast; these operations, therefore, are carried out slowly.

Very small vessels can avail themselves of an opening in the reef off Tomra, a village lying one mile westward of Serwaru; this opening is 150 yards wide and 6 to 9 fathoms deep; the reef on either side is exposed at low water. The *Dourga* warped in here, and moored head and stern to the rocks. During the N.W. monsoon the best anchorage is said to be off the village Serai on the north-east coast, but information is wanting as to this anchorage.

Moa island, 4 miles east of Letti, is about 20 miles long east and west, and is for the most part of coral formation and flat, only in the north-east part mount Karbau (Buffalo) rises to a solitary peak 4,100 feet above the sea. Reefs extend from the north-east and south-west points. There is anchorage on the east side of the island in the channel between Moa and Lakor but nowhere else round the coast. The channel between Moa and Letti is said to be safe, but it has not been explored. The cattle, with which Moa island abounds, are considered the best in these islands; Moa also produces goats, pigs, and fowls.

See chart, No. 942a [2,557], and plan, No. 1,460 [2,575].

Lakor island, separated from the south-east coast of Moa by the narrow strait of Moangai, consists of hard coral rock raised about 20 feet above the sea, and covered with wild shrubs, with here and there patches of cultivation and cocoanut trees on the sandy spots. Water is scarce and most of the necessities of life are imported from other islands. The population is small and poor. The *Dourga* anchored abreast of the western of the two villages on the north side of the island, in a depth of 7 fathoms and moored to the shore reef by a hawser; the shore is very steep-to, and the anchorage insecure.

Okenao islets and reef.—Little is known of these islets which are shown on the chart as lying on an extensive reef 10 miles east of Lakor, the reef extending 15 miles north and south, and being 8 miles wide at its northern part. The southern islet, Brisbane, lies apparently near the south-east edge of an extensive reef of shoal ground and scattered islets, and extends about $1\frac{1}{4}$ miles north-west and south-east, with a breadth of about 4 cables, and has on it clumps of trees about 115 feet high. A coral reef, drying at low water, with a narrow opening for small vessels about 3 miles northward of the islet, fringes Brisbane islet seaward to a distance of some 5 cables. A small islet, with bushes 10 to 15 feet high, lies about 6 cables south-west of Brisbane.

The south extreme of Brisbane island, which may be recognised by a conspicuous bush, is situated in lat. $8^{\circ} 21' S.$, long. $128^{\circ} 30' E.$

Tides.—The *Brisbane*, which struck on the reef off the islet of that name in January 1880, gave as time of high water 11h., and the rise of tide 6 feet. The flood stream sets to the west and the ebb to the east, only one low water was observed in 24 hours; the wind at the time was W.N.W. blowing fresh.

Luang island, 25 miles eastward of Lakor, is about 5 miles in circumference, and, being high, is visible at a considerable distance; it is surrounded by an extensive reef studded with islets, that is, about 11 miles long east and west, but the southern limit of which is undetermined. Within this reef there is a depth of 2 fathoms, affording anchorage for small craft, but it is not known if there is anchorage for large vessels in the vicinity. Luang is the only inhabited island of the group; the products of it are chiefly turtle-shell and trepang. Kalapa islets lie about 2 miles E.N.E. of Luang; close outside of these the reef is steep-to.

Sermatan island, 7 miles eastward of Luang, is about 13 miles long, and is composed of a high range of hills, extending E. by S. $\frac{1}{2}$ S. and W. by N. $\frac{1}{2}$ N., the sides of which slope steeply down to the sea; mount Wallace, a conspicuous peak near the east end of the island is 1,420 feet high. There is anchorage off Eto, close northward of the west point of Sermatan, from which a reef projects in a W.S.W. direction. The east

point of Sermatan is in long. $129^{\circ} 24'$ E. This island is thinly inhabited, and affords scarcely any shelter to shipping; its people carry on trade with Luang.

BABAR ISLAND, about 40 miles E.N.E. of Sermatan, is 15 miles long north and south, mountainous to a height of 3,000 feet above the sea, and covered with forests. There are several smaller islands near it, that of the most importance being Wetan, which lies off the west coast. The north-east and south-east sides of the island are inhabited; the central portion is unoccupied. The western side of Babar is so precipitous and overgrown with forest, that cultivation has extended but little; the small village of Tapa is the capital of the western tribe who have also plantations on the neighbouring island of Wetan. A reef extends 3 miles in an E.S.E. direction from the south-east point of Babar. A shoal, position doubtful, is charted as lying 3 miles West of the south-west point of the island.

Wetan island is more fertile and better cultivated than Babar; it is 6 miles in extent N.N.W. and S.S.E., and rises to a height of 900 feet at the northern end, and 1,160 feet at the southern extremity, the intermediate land being low. A reef projects from the south-west point of Wetan.

Anchorage.—During the south-east monsoon, the best anchorage is abreast of the village of Tapa, on the west side of Babar island, where a vessel may lie securely in a depth of about 8 fathoms, with the flagstaff bearing E. by S. $\frac{3}{4}$ S., distant 3 cables; this position is about one cable outside the 5-fathoms line, and the same distance from a reef covered by one fathom in the northern part of the roadstead, and marked at its south-west edge by a red buoy. Great caution is required in beating up to the anchorage, as the wind frequently comes off the high land in sudden squalls. During the north-west monsoon it is said that the best anchorage is close under Wetan island, eastward of Herile village situated about $2\frac{1}{2}$ miles S.W. by S. of Tapa.

There is said to be anchorage on the east coast of Babar off the entrance of a fresh-water stream, but the bottom is generally foul about this island.

Supplies.—Cattle, pigs, goats, and other provisions can be procured at Tapa. The Dutch government have a small depôt of coal there for the use of the gunboats. The Netherlands India steamers call at Tapa periodically; see page 30.

The other islands near Babar have but few inhabitants, and are seldom visited. Dai, 13 miles north of Babar, is 4 miles in length and rises to a height of 2,375 feet. Dawalur and Dawera islands which lie 10 miles N.E. by E. of Babar, have reefs extending from their coasts towards each other, with a large detached reef between, and together extend 8 miles

See chart, No. 9426, and plan, No. 2,465 [2,572].

N.W. by W. and S.E. by E. ; both are high, the latter having an elevation of 1,134 feet. There is fairly sheltered anchorage in a depth of about 12 fathoms in Watteweh road at the north-west end of Dawera in an opening of the shore reef; Watteweh flagstaff bearing E. $\frac{1}{2}$ N. leads in between the reefs on either side. Masela, 8 miles S.E. of Babar, is 7 miles in length and 839 feet high; anchorage may be had on the west side of the island, upon a bank in Lawarang road in a depth of 4 to 5 fathoms, and at the distance of about 4 cables from the shore.

TENIMBER ISLANDS.—This group, the easternmost of those which extend from Timor towards the Aru islands, consists of several thickly-populated islands, of which Timor Laut, or Yamdena is the principal; they are almost all formed of coral apparently recently raised above the sea, without harbours or shelter for shipping, and with the exception of the east coast of Timor Laut and the outlying islands Vordate, Laibabar, Selu, and Seira, are low. The inhabitants, who were estimated to number 25,000 in 1881, are a mixture of Malayan and Papuan races and are industrious cultivators and fishermen. Water is scarce and brackish, and probably from this cause fever is very prevalent. The islands Vordate, Larat, and Seira are visited by traders; the remainder of the group is almost unknown.

Timor Laut or Yamdena is 65 miles long, N.E. by N. and S.W. by S. and about 20 miles wide in the middle. The west coast is low and fronted by islets and reefs only partially explored. The east coast is formed by a range of densely-wooded hills 600 or 800 feet high. It is indented by deep bays which appear inaccessible on account of a reef which fringes the whole coast. The villages are built on the cliffs overhanging the sea, and are most difficult to approach.

Oliliat, one of these villages built on a cliff 413 feet high, about 12 miles from the south-east point of Timor Laut, was visited in 1839 by Captain Owen Stanley in H.M.S. *Britomart*. The cliff is nearly perpendicular, and can only be ascended from seaward by a flight of steps cut in the hill-side. Anchorage can be had during the N.W. monsoon in a depth of 6 to 11 fathoms at from $1\frac{1}{2}$ to 2 cables south of the point on which the village stands, but it is quite exposed to the east. Pigs and poultry appeared plentiful at the time of the *Britomart's* visit, the natives, however, were not very willing to part with their stock. Water could be procured on the beach, but a merchant vessel should be cautious in sending her boats for it, as the natives have a reputation for treachery on account of the murder of the crew of the schooner *Stedman* in 1823, whilst watering at Laura, a similar village 4 miles north of Oliliat.

Merapi reef, lying 6 miles off the east coast of Timor Laut, is 3 miles long N.W. by N. and S.E. by S., and one mile wide; it consists

See chart, No. 942b, and plans, Nos. 2,465 [2,572] and 1,460 [2,575].

of rock, and dries in parts at low water. From its south-east end the east extreme of Larat island bears N.N.E. $\frac{1}{2}$ E., and the near projecting point of land W. $\frac{3}{4}$ S.

Garnusa reef lies 5 miles northward of Merapi reef, and is about 2 miles in diameter; an islet and some rocks above water lie upon the reef. The channel between these reefs and the coast of Timor Laut is said to be foul.

An islet lies 2 miles off the projecting point of Timor Laut, northward of Garnusa reef, and in the bay further north there is a reef 2 miles N.W. of the same point.

Larat island is separated from the north-east end of Timor Laut by the narrow Wallace channel, which is only fit for boats. The island is 15 miles in length E.S.E. and W.N.W., its south-west and south-east sides being bordered by reef extending one mile out. There are three villages on its northern shore, and off the centre one there is anchorage about 6 miles from the west point. Ritabel bay, at the northern end of Wallace channel, is about $1\frac{1}{4}$ miles long and 3 to 4 cables wide; it affords good and well-sheltered though limited anchorage off the village of Ritabel on the Larat shore, in a depth of from 7 to 10 fathoms, mud. Just northward of the town a reef extends out nearly $1\frac{1}{2}$ cables, the outer point of which is marked by a beacon. A reef with a depth of 2 fathoms on it, lies in the approach to this bay, from which Ritabel point bears S. 2° W., distant a little over 2 miles, and north extreme of Barnusa island N. 58° W. A shoal, with a depth of $2\frac{1}{2}$ fathoms, lies N.E. $\frac{3}{4}$ E., distant 7 cables from the above reef. To enter Ritabel bay steer in with Ritabel point bearing S. 2° E., which leads between the 2-fathoms patch and the western reefs; when within the entrance points of the bay the fairway runs about S. 4° W. up to the anchorage. A Dutch official resides at Ritabel. A steamer of the Netherlands India Company touches at Larat periodically; see page 30.

Vordate island, separated from Larat by a navigable channel one mile wide, is 8 miles in length N.N.E. and S.S.W. Like Larat it is high and well wooded, but the hills are more distinct. Its shores are lined with reefs and rocks, and 2 miles off its south-eastern shore lies Schildpad reef which runs parallel to the shore for 5 miles. The island is well cultivated, and is the centre of commerce of the Tenimber group, but great caution must be exercised when dealing with the natives, although many of them profess Christianity, having been converted by the Dutch missionaries. There is anchorage on the north-west side of Vordate during the S.E. monsoon in a depth of 20 fathoms, sand, about 3 cables W.S.W. of the village Sobiani at one cable from the shore, and near the reef. Fresh water may be obtained here. In the N.W. monsoon the native traders anchor within the north-west entrance of the strait between Vordate and Larat.

Molu island, the northern island of the Tenimber group, is about 7 miles in length north and south, with an islet and reef off its northern side. There is anchorage off the village of Adodo near the north-west point. Between its south point and the northern coast of Timor Laut are several islands, the channels between which do not appear to be safe. Vessels approaching Vordate from the westward must pass northward of Molu.

ISLANDS OFF the WEST COAST of TIMOR LAUT.—

Laibabar rises in a symmetrical peak about 2,000 feet high. Selu island, 35 miles S.W. of Laibabar, is the highest of the group; the chart shows a reef extending 3 miles out from its north-west point. But little is known of Nuswotar, Wariari, and the other islands between Laibabar and Selu—they are reported to be low and surrounded by reefs.

Seira island, the southernmost of the chain of islands off the West coast of Timor Laut, is about 10 miles in extent, elevated, and well cultivated. Reefs extend off the north and west coasts, and for 4 miles off the south-west point with several islets and rocks on them. On its northern side is the village of Wailutu, the residence of a native chief appointed by the Dutch. There is anchorage in Wailutu road, in a depth of 18 fathoms, at about 3 cables from the shore, with the flagstaff of the village bearing S.S.W.; great care must be exercised when approaching the anchorage as the shore reef immediately westward of it extends out to the distance of a mile.

Bara Sadi reef, with only 4 feet water over coral, lies 8 miles S.W. by W. $\frac{1}{2}$ W. from the south-west point of Seira, with the west extreme of Selu island bearing N. $\frac{3}{4}$ E. About 3 miles southward of this reef, depths of $7\frac{1}{2}$ to 10 fathoms, coral bottom, were obtained, and a bank with $5\frac{1}{2}$ fathoms least water over it lies 4 miles E.S.E. of Bara Sadi reef.

Watergeus reef, with $3\frac{3}{4}$ fathoms over it, lies about midway between the south-west points of Seira and Selu, with the west extreme of Seira bearing S.E., and Sekelur islet off the north-west point of Seira E. $\frac{1}{8}$ N.*

Discoloured water.—In 1880 the commander of H.N.M.S. *Madura* reported the existence of discoloured water with an estimated depth of 7 to 8 fathoms in lat. $7^{\circ} 59' S.$, long. $130^{\circ} 42\frac{1}{2}' E.$

Egeron strait, separating Selaru from Timor Laut, is 6 miles wide, but several islands surrounded by reefs, which lie in the entrances, narrow the channels to one or $1\frac{1}{2}$ miles in width; the channels, however, present no difficulty to a vessel carefully navigated, and carry depths of from 9 to 15 fathoms.

* The charts of this region must be followed with caution, as the Dutch publication, on which the Admiralty chart is based, differs considerably from the map of H. O. Forbes.

See chart, No. 942b [2,558], and plan, No. 2,465 [2,572].

There appears to be good and secure anchorage on both sides of Egeron strait, in bays somewhat similar in form, and $1\frac{1}{2}$ miles wide, that penetrate the land to the distance of 3 or 4 miles. The anchorage in Timor Laut is off the village of Laktanae, in a depth of 8 to 15 fathoms; its approach lies westward of the island of Astuban. The anchorage in Selaru bay is off Adaut, or further up the bay which is clean to its head, in a depth of 8 to 10 fathoms, sand. The edge of the reef extending from the Adaut shore is marked by a ball-beacon.

Selaru, the southernmost of the Tenimber islands, and separated from Timor Laut by Egeron strait, is 25 miles long north-east and south-west; little is known of any but its north-east coast. The south point is low, and fronted by a dangerous reef, projecting more than one mile from it, off which the currents are variable and strong at times. The land about the point is covered with trees, and the shore about one mile eastwards presents a rocky face, the east end of which appears to form the entrance of a river; it is remarkable by a large detached fragment of rock resembling the hull of a ship. A small wooded islet is shown on the chart $1\frac{1}{2}$ miles W.N.W. of the South point. The north-west coast and north-east point are bordered by reef.

At the distance of 5 miles N. $\frac{1}{4}$ W. from the west point of Selaru there is a reef with probably 7 fathoms water over it, from which the north extreme of that island bears E. $\frac{1}{4}$ N. In May 1902, the s.s. *General Pel* reported the existence of a reef situated with the western point of Selaru bearing S. 18° W., and the northern extreme of the same island S. 84° E.

A wooded island lies 8 miles W. by N. $\frac{1}{2}$ N. of the south-west point of Selaru; it is 2 miles long north-east and south-west, two-thirds of a mile wide, and 150 feet high.

Myrmidon bank with 9 fathoms over it, and deep water around at a distance of 7 cables, lies about 5 miles S.W. $\frac{1}{2}$ W. from the above mentioned island, but its position has not been accurately determined; a depth of 16 fathoms, sand and coral, was obtained about 4 miles southward of this bank.

For the Arafura Sea and the approaches to Port Darwin, see Chapter XIV.

See chart, No. 9426 [2,558], and plan, No. 2,465 [2,572].

CHAPTER XIII.

ISLANDS OFF THE NORTH-WEST PENINSULA OF NEW GUINEA ;
NORTH-WEST AND WEST COASTS OF NEW GUINEA.

VARIATION in 1902.

Waigiu island	-	1° 55' E.		Cape Valsche	-	3° 15' E.
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The north-western and western coasts of New Guinea are comparatively little known, being out of the ordinary track of ships, and seldom visited by European vessels for trade. Native praus from Makassar visit the coasts annually, and barter European goods for wild nutmegs, pearl shell, trepang, &c. The western part of New Guinea, westward of long. 141° E., is included in the Dutch residency of Ternate.

Much of our knowledge of the west coast was first derived from the voyages of Kolff in 1826, Lieut. Modera in 1828, and Captain D'Urville in 1839. More recently examinations of some parts have been made by various Dutch officers; the Italian explorers D'Albertis, O. Beccari, G. E. Cerruti, and Captain Conte Lovera di Maria, commanding the Italian corvette *Vettor Pisani*, and the officers of the German cruiser *Gazelle*. All these authorities have been referred to for the following description. A descriptive historical sketch of the people of Western and North-western New Guinea will be found in "La Papouasie," par Docteur Cte. Meyners D'Estrey, 1881.

The north coast of Waigiu was examined by Forrest in 1775, D'Entrecasteaux's expedition in 1793, and D'Urville's expedition in 1828. The south coast by Dr. A. R. Wallace in 1860, and by the yacht *Marchesa* in 1883.

Winds and weather.—On the West coast of New Guinea, the south-east monsoon lasts from April to October, and the north-west monsoon for the remainder of the year, with sometimes variable winds between N.N.W. and N.E. in January. In the spring the weather is often changeable; in March, April, and May, storms and squalls are experienced, and heavy rains from June to September. From October to May the weather is serene and fine.

ISLANDS NORTH of NEW GUINEA.—Lord North island, Helen and Carteret reefs, as well as the other islands between New Guinea and the Pelew islands are described in Pacific islands, Vol. I. (Western groups).

See chart, No. 9426 [2,558].

Asia islands are three low, flat islets occupying a space 5 miles in length north-east and south-west. A reef extends about one mile north-east from the northern islet.

Position.—Northern islet, lat. $1^{\circ} 3' N.$, long. $131^{\circ} 17' E.$

Aiu or Yowl islands, lying north of Waigiu, consist of about 20 small islands surrounded by reefs, covering on the chart an extent of 28 miles N.N.E. and S.S.W., by 13 to 15 miles across. The southern and central islands were visited by Captain Forrest in 1775, and were described by him as being five in number, stretching about 13 miles east and west. The largest of them, Aiu Baba, is 3 miles long, 500 feet high, and is inhabited; its reef extends 3 miles to the southward and 6 miles to the south-westward. Abdon and Konibar, the central and northern of the larger islets, are about 200 feet high. The northern islands are laid down by Captain Forrest from native accounts; they are reported to be low and wooded. The channel between these islands and the Asia islets has been traversed by many vessels; no dangers have been discovered in it. Budd, or Florentia islet, first seen by D'Urville in 1828, is low and wooded; it is placed on the chart 17 miles W.N.W. of Aiu Baba.

The Siang and Wiang islands have been described in Chapter XI.

BOUGAINVILLE STRAIT.—This strait, between Ruib island, of the Wiang group, and cape Forrest, the north-west point of Waigiu, was first traversed by M. Bougainville in 1768, and since then by the exploring expeditions in 1793 and 1823–1827. The available width of the channel is reduced to 3 miles by rocky islets lying south and south-east of Ruib; there are no known dangers in the strait, except the reef off cape Forrest, and a bank in the south-west entrance of the strait, on which the *Recherche* struck 5 fathoms, but which has not been further examined. There is, however, a coral bank with a depth of 7 fathoms and probably less water over it, lying 3 miles to the northward of the 5-fathoms patch, with which it may be connected; this coral bank (discovered in 1899) lies with the south point of Ruib island bearing N. $47^{\circ} E.$ distant 5 miles, and the west extreme of Balabalak island N. $24^{\circ} W.$ Vessels should pass south of the rocky islets off Ruib, and may pass either north or south of Shaggy rocks.

The currents in the strait are reported to be strong, but information is wanting as to the direction in which they set.

WAIGIU ISLAND is 65 miles in length, east and west, with 25 miles greatest width, and is nearly divided into two by an inlet on the south side. The island is hilly and uneven; but there are no very high mountains, the highest peak, Buffaloes Horn, being estimated by the officers of the *Coquille* at 1,516 feet. The north coast shows hard

See chart, No. 942b [2,558], and plan, No. 912 [2,624].

crystalline rocks, but the south coast is mostly of coral limestone, fissured and worn into many fantastic shapes. The whole island is clothed with dense forest. The climate is hot and moist. The inhabitants appear to be immigrants from New Guinea, Gillolo, and surrounding islands, mixed in various degrees. The language spoken is that of north-west New Guinea. Sago is the chief food, rice is unknown.

The northern coast of Waigiu was explored by Captain Forrest in 1775; it is described as generally bold; but reefs extend from some points, and islands near the shore. There are several sheltered harbours on the coast where fresh water can be obtained.

Cape Forrest is the north-west point of Waigiu; two detached reefs lie off the point, which should not be approached within 2 miles. Mée island, with rocks on its north and east sides, lies close to cape Forrest, and its precipitous west end, 590 feet high, appears from the south-west to be part of the mainland.

Piapis harbour is situated about 2 miles eastward of cape Forrest; the entrance is about half a mile wide, and has a depth of 20 to 30 fathoms in it. Foul ground extends half a mile out W. by N. $\frac{1}{2}$ N. from the eastern entrance point, which can be avoided by keeping on the western side, where there is a haycock-shaped rock 15 feet high, with a depth of 10 fathoms muddy bottom, close to it. Within, the harbour divides into two arms, penetrating about $1\frac{1}{2}$ miles to the southward. Hill islet, on which there is a pool of fresh water, lies in the centre of the western arm. Anchorage can be had between this islet and the western entrance point in a depth of 15 to 25 fathoms, mud. At the head of the eastern arm there is a small brook of water, and here good timber for masts may be obtained.

Shoe islet lies off the coast about 9 miles east of cape Forrest; and the Buttons islets extend 4 miles N.W. of Shoe islet; it is not known if there are any dangers about these islets. Arago bay, eastward of Shoe islet, is about 2 miles wide, and contains several islets.

Ports Duperrey and D'Urville are situated on the west and east sides respectively of a narrow peninsula about 13 miles east of Shoe islet. Both ports are small circular bays, rather more than a quarter of a mile in diameter, with soundings of 10 to 20 fathoms, sand or coral, excepting near the shores, where the water is very shoal in some parts. Both are open to northerly winds. There is a brook of fresh water on the south shore of port Duperrey, and several streams run into port D'Urville.

Offak harbour is about 30 miles eastward of cape Forrest, bounded by high land, and not easily discerned from the offing. On the east side of the entrance stands a sugar-loaf hill, about 500 feet high, and inland there is a conical peak, Buffaloes Horn, which is in line with the Sugar

loaf, bearing S.S.W. The entrance of the harbour is about a quarter of a mile wide in the narrowest part, and 20 to 30 fathoms deep, with one patch of 9 fathoms in mid-channel. The eastern side of the entrance is bordered by a reef to a distance of one cable, and several rocky islets, named Offing islands lie just outside; beyond these, at a distance of 4 cables N.N.W. of the eastern point, lies a shoal covered by 2 feet of water; the Léléde rocks, also rocky islets like haycocks, lie on the eastern side of the channel entrance. The western side is clear.

Within, the harbour extends 2 miles to the westward, and 3 miles to the eastward, with depths of 20 to 30 fathoms. To the southward, fronting the entrance, is Repos island, connected with the shore by a reef which also extends 2 cables west of the island, forming an inner port, Jacquinot bay, where the depth is 12 to 20 fathoms, muddy bottom. There is a pool of fresh water on the island. Just to the east of the eastern point within the entrance is a small cove with a depth of 8 to 22 fathoms, in which the *Coquille* anchored; a stream of fresh water enters the cove.

Cape Freycinet, the northernmost point of Waigiu, stands $3\frac{1}{2}$ miles east of the entrance to Offak harbour, and is high.

Manuaran island, 11 miles east of Offak harbour, is of moderate height, and has some islets off its western side; the channel between the island and the shore is 2 miles wide, with irregular depths of 9 to 20 fathoms.

Shoals.—A shoal covered by less than 6 feet water, is shown on the chart 4 miles E.N.E. of Manuaran island. Another bank of $4\frac{1}{2}$ fathoms but on which there may perhaps be less, is shown as lying 8 miles east of Manuaran and 3 miles off the Waigiu coast.

Lawak island and bay.—Lawak island lies $3\frac{1}{2}$ miles S.E. of Manuaran island, and is separated from the coast by a navigable channel about $1\frac{1}{2}$ cables wide between the reefs, and 6 to 9 fathoms deep. Upon the north side of the island there is a remarkable hill. The eastern point of the island projects in a long peninsula, steep-to, called the Dolphins Nose. Lawak bay is on the east side of the island between the Dolphins Nose and the coast of Waigiu, and has depths of 17 fathoms, decreasing to 10 fathoms within two detached reefs lying a quarter of a mile from the island. A ship may be tolerably sheltered here but the bay is open to the eastward; there is also anchorage in a depth of 7 to 9 fathoms S.S.E. of the south point of Lawak, sheltered from all winds except those from the north-east. Water may be obtained from two streams on the Waigiu shore.

Kabarei bay, open to the north-west, is situated $1\frac{1}{2}$ miles south-east of Lawak. Its entrance is about one mile in width, with a depth of 12 fathoms, decreasing to 5 fathoms near the reefs and within. In its

See chart, No. 9426 [2,558], and plan, No. 912 [2,624].

south-west part is Saouni harbour, formed within some islets and reefs, where small vessels find anchorage in about 2 fathoms, near the village. Water can be obtained in the south-east part of the bay.

Boni harbour, about 5 miles east of Kabarei bay, is formed by a bend in the coast, fronted by Boni island and the reef which extends 2 miles north and one mile east of that island. The northern entrance, between the Boni reef and the narrow fringe reef of the Waigiu coast, is $2\frac{1}{4}$ cables wide, with a depth of 10 fathoms, in mid-channel. Anchorage can be had in 7 fathoms, mud, just within the entrance, or in a depth of 13 to 18 fathoms coral, about a mile farther in, off the mouth of a stream on the Waigiu coast, west of Boni island. The eastern entrance, between the Boni reef and the islet Bombédari, $1\frac{1}{2}$ miles south-east of Boni, is 3 cables wide and 12 to 30 fathoms deep; but few soundings have been taken in it, and the limits of the reefs on each side are not well defined.

The French ships *Recherche* and *Esperance* during the search for La Perouse, spent a fortnight at Boni anchorage in August 1793; their crews being afflicted with scurvy. Good water was obtained from a stream on the Waigiu shore, south of Boni island, and the natives supplied the ships with turtle, pigs, fowls, sago, and fruit.

The islet Bombédari, above mentioned, is connected with the shore to the eastward by a long narrow reef; between this reef and the coast there is a depth of 10 fathoms, mud, probably affording sheltered anchorage, but the place has not been closely examined.

Tides.—According to observations at Boni anchorage by the French ships, it is high water full and change at 5 hours, rise of tide 6 feet. The tidal stream ran with a velocity of half a mile an hour; direction not stated.

EAST COAST of WAIGIU.—From Boni harbour the coast trends E.S.E. for 11 miles to cape Lamarche, and then S. by E. for 12 miles to Ume or Pigot point, the south-east point of the island, which is of moderate height. Between the two points the shore is bordered by a wide reef, probably connected with Buccleugh shoal. Two small wooded islets named Waison and Wayam lie 4 miles S.S.W. of Pigot point.

Buccleugh shoal lies about 7 miles E.N.E. of Pigot point and extends 5 miles to the eastward as far as is known, but this shoal has not been examined; on the western end there is as little as 2 fathoms water, perhaps less. In 1877 the U.S.S. *Alert* passed between this shoal and Waigiu island, and though 8 fathoms was the least depth obtained, rocky heads were observed that in many places approached the surface; the water was very clear, and the bottom was seen nearly the whole distance between the shoal and Pigot point. This passage must be considered dangerous, and is not recommended.

See chart, No. 9426 [2,558], and plan of Boni harbour, No. 1,416 [3,190].

The **SOUTH COAST of WAIGIU** is fronted by several detached shoals and islands, and is but little known.

Grosvenor reef, of sand and rock, covered by 9 feet water, and with no bottom at 60 fathoms close to, lies about 6 miles south-east of Pottopau point, but its exact position is not determined.

Bombay bank is a dry sand bank to which two positions are assigned on the chart, both being doubtful: one S. by W. one mile from Wayam island, and the other 4 miles further S.W. by W.

Kabiai gulf or Waigiu sea extends in a north-western direction, penetrating Waigiu to within 2 miles of the northern coast 3 or 4 miles westward of Offak harbour, and nearly cutting through the island. At its northern extremity there is a safe harbour, named port Blossville by the officers of the *Coquille*, who examined it from Offak harbour. The gulf has not been explored, but it can be approached with safety by keeping Pottopau, the western entrance point, on a N. by W. $\frac{3}{4}$ W. bearing, until King William island is in line with the two points of the coast south-west of the entrance; when the course must be altered for the anchorage off Moreha, which lies on the north shore at the extreme of the gulf.

Moreha road (Momos).—The population of the town is principally Malay. A few supplies, such as goats or fowls, may be obtained here, but are not plentiful. Good water may be had from the stream westward of the village. Moreha is visited by a Netherland vessel of war annually. There is anchorage in a depth of 10 fathoms half a mile south of Moreha flagstaff with Kebang Kele point bearing East. Moreha road should be approached with the flagstaff bearing between N. $\frac{1}{2}$ W. and N.N.E., in order to avoid the reefs on either hand, which lie at the distance of about 3 miles from the village.

Kapiboi is a large village, the residence of the Rajah of this part, about 15 miles westward of the entrance of Kabiai gulf. There is a channel close along the shore from Kabiai gulf, inside the banks, but a careful look-out is required from the mast-head; a vessel should pass northward of Little Saonek island. There is anchorage on the north side of Saonek Besar in 15 to 18 fathoms, at about $2\frac{1}{2}$ cables from the shore. The depth increases a short distance outside this position, and thence across to the Waigiu coast it exceeds 30 fathoms.

Gamen island appears as part of the south coast of Waigiu, being separated from it only by narrow channels leading into an extensive unexplored bay. It is 15 miles in length, east and west, and composed of raised coral; the southern shore consists of limestone cliffs, underworn by the action of the sea.

In 1877 the U.S.S. *Alert* anchored in a depth of 20 fathoms near the western entrance of a large bay on the south side of Gamen island. From

a partial examination of the bay depths of 4 to 10 fathoms were found in the entrance, within which are several coral reefs having deep water between. There are numerous villages on the shore of the bay.

WEST COAST of WAIGIU.—Nothing is known of this coast, which is indented north of Gamen island by a wide bay fronted by several islands; of these the Batangapilli group are the outermost. At the distance of 4 miles W.N.W. of Dyo, the most western of the Batangapilli islands, soundings of 15 fathoms have been obtained, and the discoloured appearance of the water indicated shoal depths between the above position and Dyo.

DAMPIER STRAIT, also named **GAMEN STRAIT**, separating Battanta island from Waigiu, takes its first name from the great English navigator who explored it. It is 65 miles long from cape Mabo, the west point of Battanta, to cape Pigot, the south-east point of Waigiu; but the narrower and difficult part of the strait northward of Battanta, is only 30 miles long. The soundings are in general deep and irregular, the bottom gravel, with coral and shells in some places.

This strait has not been surveyed; the islands and reefs in it have been laid down from various authorities, and their positions can only be considered approximate.

Winds.—In general the winds are variable in Dampier strait, but in December and January sudden squalls from North and N.W. are experienced in its northern part, with heavy rain and a great swell from the south.

Tides.—Systematic observations as to the tides are wanting; it appears from such observations as have been recorded that it is high water at full and change about 6 hours; springs rise 10 to 12 feet. The flood stream sets to W.S.W., and the ebb to E.N.E., but the streams appear to be greatly affected by the prevailing monsoons.

In the height of the north-west monsoon, in the narrow part of the strait, between Pigeon and Foul islands, the ebb at springs runs to the **N.N.E.** for 6 or 8 hours at the rate of 4 to 5 knots, and from one to 3 knots at neaps. The flood sets south-west for 3 or 4 hours, but is weak. During the height of the south-east monsoon, in this part the flood sets westward for 8 or 10 consecutive hours, turning successively W.S.W., S.W., and S.W. by S.; it then attains its greatest velocity, which at springs sometimes exceeds 5 knots an hour, and at neaps 4 knots. The ebb at this season runs **E.N.E.** or **N.E.**, and is neither strong nor of long duration.

The Tameai or Jef-fam islands, lying off the western entrance of Dampier strait, form a large group of low islands occupying a space about 15 miles long north-east and south-west, and 10 miles wide

that is entirely unexplored; a berth of at least 4 miles should be given in passing south-east of them, as in 1877 a line of coral reefs was seen from the *Alert* lying parallel with their south-east side, with apparently deep water between.

King William island is about 7 miles long, E.N.E. and W.S.W., and high, being visible at a distance of 35 miles; when first seen in coming from the eastward three hills on it appear like separate islands. The shores are steep and in most parts are covered by trees; on the eastern extremity there is a white patch; on the north side there is deep water at a quarter of a mile from the shore. Hump island with a round rocky islet a short distance outside it lies off the east end of the island. The passage between King William island and Gamen is much obstructed by coral reefs, which extend in patches across the entire channel, with depths of 20 to 50 fathoms between them.

Augusta and Pigeon islands are two small low wooded islands, lying about 3 miles south of King William island, and forming the north side of the narrowest part of Dampier strait. They are surrounded by reefs with intricate channels between them, and vessels are recommended not to attempt to pass between them and King William island. A chain of coral patches appears to extend 3 miles from Augusta island in a west-south-west direction.

The coral reef on the south side of Pigeon island, with only 3 or 4 feet water on it, projects about half a cable's length, and the water deepens quickly to 10 fathoms.

Anchorage.—The U.S.S. *Alert* anchored in a depth of 10 fathoms, coral, with 6 to 10 fathoms around, southward of the opening between Augusta and Pigeon islands. There is a bank extending eastward for 4 or 5 miles from Pigeon island with depths of 4 to 16 fathoms on it suitable for anchorage, the bottom being mostly sand and gravel. On this bank 2 miles E. by N. of the island is the shoalest part of 4 fathoms, with deeper water on either side.

Danger.—The *Sophia Fraser* grounded on a coral reef that lies 9 miles E. by N. of Pigeon island; it is of small extent and has deep water close to the edge which dries. The bearings given for the reef do not agree, and its position must be considered uncertain.

Woodford shoals are several rocky patches on which the *Woodford* and other vessels have struck, lying S.W. by W. of King William island; three patches are shown on the chart: one lies 6 miles W. by S. of Augusta; another 9 miles W.S.W. of the same island; and the outer patch of 4 fathoms, 12 miles W.S.W.; but there are probably many other shoals between King William island and the Tameai islands, as that region has not been examined.

Battanta island lies on the south side of Dampier strait, and is separated from Salvatti by Pitt strait. It is about 35 miles long E. by N. and W. by S., and high, being visible at a distance of 30 miles. Fisher island, a small high islet, lies 2 miles W. $\frac{1}{2}$ N. from Cape Mabo, the western point of Battanta.

Vansittart bank is the shoal water extending north of Battanta, and forming the south side of Dampier strait; its edge is almost steep-to. It gradually increases in breadth from each extremity of the island, its northern part being 6 miles distant and embracing Foul or Vuil island, which lies 8 miles E.S.E. of Pigeon island. The safe channel is here only 3 to 4 miles in width. Mansfield island, 5 miles east of Foul island, is a bank of white sand with a clump of high trees upon it, on the edge of the bank, and within it are numerous islets, scarcely distinguishable, being so near the shore.

Battanta reef, about 2 miles in width, extends 9 miles eastward from Evanas point, the eastern extreme of Battanta, and has depths of 2 fathoms near its outer extremity, but it has not been examined. The *Marchesa* crossed the ridge connecting Battanta reef with Vansittart shoal, and found a depth of 10 fathoms with the south-east point of Battanta just open of Evanas point. Westward of this line the water appeared to be very shoal.

Marchesa bay, so named from the yacht which first explored it in October, 1883, is formed between the two eastern peninsulas of Battanta, the land around being elevated 300 to 1,000 feet. In its entrance, which is 2 miles wide, lies Ayam island, about 600 feet high; the safe channel passes north of it. Thence, the channel extends 3 miles to the west, terminating in Paradise harbour. South of the parallel of Ayam island the bay appears to be full of reefs, but north of this the channel seems clear of dangers, no bottom being found at 10 fathoms up to the entrance of Paradise harbour, which has not been examined. A reef extends $3\frac{1}{2}$ cables east of Scarf point, the south point of Paradise harbour, and midway between this point and Toe point to the north, there is anchorage in a depth of 13 fathoms. Mangrove harbour, within Toe point, is 2 cables wide, with depths of 10 fathoms, mud.

Directions.—In approaching Dampier strait from the westward, care must be taken to give the Tameai islands a berth of at least 4 miles, but the west end of Battanta may be neared, it is believed, with safety. When Cape Mabo bears south, a course should be steered to keep within 3 to 5 miles of the north coast of Battanta in order to avoid the Woodford shoals, till Augusta island bears N. by E., when Mansfield island will be seen in line with the south point of Foul island. The course must then be altered more to the northward to avoid the edge of the Vansittart bank, observing not to approach Foul island nearer than 5 or 6 miles while it bears east,

See chart, No. 9426 [2,558], and plan of Marchesa bay, No. 912 [2,624].

nor within 3 miles of it in any direction. When past Foul island, the water becomes very deep to the eastward.

Thence a course should be laid to pass south of the dangers lying off Waigiu, keeping over towards Pigot point, if the wind be from the northward, to avoid being driven on to the New Guinea coast by the swell from the north. Great attention must be paid to the set of the currents.

In approaching from the eastward, Pigot point should be made out, a good berth being given to Buccleugh shoal, which may be avoided by keeping Wayam island to the westward of W.S.W.; then proceed, reversing the directions given above.

PITT or SAGUIEN STRAIT, between Battanta and Salvatti islands, is about 33 miles in length between the west point of Salvatti island and the eastern extremity of Battanta reef, and is from 3 to 5 miles in width. The Salvatti shore is in general high and steep-to; the Battanta shore is also safe nearly throughout, except in some places where it is bordered by rocks to a distance of a quarter of a mile. There are frequent calms in the strait on account of the high land on each side, and the rapid tides are attended with strong eddies by which vessels are rendered unmanagable and subject to serious dangers; this strait should never be taken, therefore, by sailing vessels.

South coast of Battanta.—Fisher island and cape Mabo have already been described; at 2 miles east of cape Mabo there is a reef between two small islets near the shore. About 12 miles east of cape Mabo there is a bay with a depth of 45 fathoms, black sand, at half a mile from the shore. The *Marchesa* found good anchorage in 17 fathoms in a bay protected by a reef extending half-way across from its eastern point, with Saguien island bearing S.W. $\frac{3}{4}$ W. Marchesa bay, and Battanta reef have been already described.

SALWATTI ISLAND is but little known. Near the north-west point of the island there is a small island, Saguien, to the eastward of which there is a bank with depths of 30 to 65 fathoms over it, very near the shore, where vessels have found temporary anchorage. At 12 miles eastward of Saguien there is anchorage in Tipin road in a depth of about 24 fathoms, at the distance of 2 cables from the shore. Brown coal was found by the *Gazelle* at West harbour on the east side of Salvatti.

Snapan island, off the north-east extremity of Salvatti, is high and surrounded by reef which extends 4 cables to the south-west; several small islets lie close to the northern part of Snapan, and a detached reef lies at the distance of half a mile E. by N. from the north point of the island. Several islands lie east and south-east of Snapan, in the northern approach to Selé strait. Havik reef, reported in 1880, with 2 fathoms water over it, the position of which is doubtful, is charted as lying 9 miles N.E. by E. $\frac{1}{4}$ E. from Snapan.

See chart, No. 9426 [2,558], and plans, Nos. 1,416 [3,150] and 3,027 [3,179].

Samatti (or **Salwatti**), near the north-east extremity of **Salwatti** island, is a large town where a few supplies can be obtained. There is anchorage in a depth of 6 fathoms about one mile from the shore, with **Ram** rock (tolerably high and wooded) bearing W. $\frac{3}{4}$ S. **Kampong** point S. $\frac{1}{4}$ E., and **White** rock E. by N. There is also anchorage in 4 fathoms nearer the shore, but a pilot is necessary to reach it.

Directions.—In approaching **Samatti** roadstead from the westward, pass northward of **Snapan** island at a distance of not less than half a mile, and steer for a remarkable white rock in the form of a crouching lion (which opens of **Snapan** island on a S.E. by E. bearing) on a S.E. $\frac{1}{2}$ S. course, until **Ram** rock (which opens of **Snapan** island when bearing S.E. $\frac{3}{4}$ S.) bears S.S.W., then steer South for **Kampong** point (east of the village). This latter course leads clear of a dangerous shoal in the bay. **Kampong** point must not be steered for on a course eastward of South, as reefs lie between **Snapan** island and the reef 9 cables N.N.E. $\frac{1}{4}$ E. of **Ram** rock.

The west coast of **Salwatti** island is little known; the chart shows a reef with several islands on it projecting 8 miles off shore, and extending 12 miles north and south, with depths of 7 to 11 fathoms near it.

Broken islands consist of a cluster of islets, about 3 miles in extent, lying south of the above reef, and with the inner islets distant 5 miles from the south-west shore of **Salwatti**.

Sailolof is a village on the south-west coast of **Salwatti** island, south-west of which there is anchorage at the distance of 4 cables from the shore in $7\frac{1}{2}$ fathoms, the minimum depth in the approach to it between **Broken** islands and **Galewo** being 5 fathoms. Parallel to the shore on the northern side of the anchorage, and distant $1\frac{1}{2}$ cables from it, there is a reef nearly uncovering at low water inside of which there is a boat passage.

Galewo, a small islet lying $2\frac{1}{4}$ miles from the south-west coast of **Salwatti**, is the westernmost of several islets situated in the southern entrance to **Selé** strait; **Membok** islet, $2\frac{1}{4}$ miles E.S.E. of **Galewo** is the southernmost of the group.

SELÉ or **KABOBOLOL STRAIT**, formerly known as **Galewo** strait, separating **Salwatti** island from **New Guinea**, was first traversed by **Captain** **Watson** in the *Revenge* in 1764. It was examined by **Lieut.** **McCluer**, who went through it with the *Panther* and *Endeavour*; by **Signor** **Cerruti** in the yacht *Alexandra*, in 1870; by the Italian corvette *Vettor Pisani*, in 1872; and the German war-vessel *Gazelle*, which passed through it in June, 1875. The most recent information is given in the Netherlands Government plan of 1896, but the survey is very incomplete. Much of the following is due to **Capt.** **V. Schleinitz**, of the

See chart, No. 9425, and plan of **Selé** strait, No. 1,416 [3,190].

Gazelle, who states that this strait is preferable for steamers to either Pitt or Dampier straits, the currents, which take the direction of the strait, being weak; and good anchorage is to be found in it.

English or Selé point, the western extreme of New Guinea, and the southern point of entrance of Selé strait, is low and covered with bushes, but behind are ranges of hills 1,000 to 2,000 feet high. Reefs extend about 4 miles southward of the point, and for a few cables westward of it, but on the north side it appears to have deep water close-to. About 4 miles south-eastward of the point are the two Orse islets surrounded by a reef. Breakers were observed by the *Gazelle* south of English point extending as far as the Orse islets.

Membok islet lies $1\frac{1}{2}$ miles N.W. of English point, the channel being between them. Breakers were observed between Membok and Galewo islets and the group of islands northward of them. Membok is uneven or rugged, but Galewo is undulating and both form good marks for the entrance.

Directions.—In approaching Selé strait from the southward the depths will be found to vary from 7 to 20 fathoms changing sometimes more than 4 fathoms between two casts of the lead; caution must therefore be exercised as shoaler water may exist, and the water is not clear enough for dangers to be visible. The best course is to head for Galewo island, which can hardly be mistaken for any other island, until English point bears N.E. by E., distant about $3\frac{1}{2}$ miles, and then steer N.E. $\frac{1}{2}$ N. into the strait between Membok and Peli islands on the port hand, and English point and Luga islets to starboard. After Membok island is passed the south-east point of Salwatti island should be kept a little on the port bow, and passed at a distance of half a mile. The south-western part of the strait from English point for a distance of nearly 11 miles forms a wide, deep, and clear channel, for which no particular directions are needed, except that Delfzyl island should be kept on the starboard side. At 3 miles beyond Delfzyl island is the commencement of a wide area filled with islands and reefs, among which, at the southern part, there are several navigable channels that may be used by vessels passing through.

If taking the easternmost route when off cape Cora steer about north-east to pass close westward of First Passage (Weg) island (on which there was a tall tree in 1875), in order to avoid a sunken reef which lies N.W. of it. This course, N.E., should then be continued for $2\frac{1}{2}$ miles until a small, high, island—Second Passage island—bears about N. by E.; then a course N. by E. $\frac{1}{2}$ E. will lead past the east sides of Second Passage island (which should be kept close aboard to avoid a reef extending 4 cables westward from Reef island) and Third Passage island. These passed, a

See plan of Selé strait, No. 1,416 [3,190].

N. by E. course for 7 miles will lead up to the passage between Watson (Kabra) island on the east side and the Soraing and Batimé islands on the west, the track lying between scattered islets on either hand. A reef extends 2 miles N.N.E. $\frac{3}{4}$ E. from the north point of Watson island; and the shore reef off the north-east part of Warir island extends in a N.N.E. direction from the south-east end of Batimé along the whole length of Warir, when it curves northward and westward embracing Kasim island. A small detached reef lies in the channel off the north-west end of Watson island. The track continues in a N.N.E. $\frac{1}{4}$ E. direction midway between the above reefs until the centre of Kasim bears W. by N., when a course N. by W. will lead eastward of Wedge island (small and high), and between the long, low, Seeland island and Exit island, into the eastern part of Dampier strait.

Another route through the strait after passing cape Cora lies along the eastern side of Great Johns island and westward of Caplap island and the two islets immediately north of it, passing south-eastward of a group of three other small islets lying half a mile from the east side of Petermann island; thence the track lies in a N.N.E. direction towards the passage westward of Watson island, leaving the reef projecting from the north end of Salutun island to starboard, and a bank one mile S.E. of Masigi island to port.

Anchorage.—On emerging into the wider area from the southward, a channel will be seen to the north-west between a large and a smaller island; this channel, by keeping the large island (Great Johns) on the starboard hand leads to West harbour, where there is very good anchorage in a depth of 10 to 12 fathoms, mud, between Vivien island and the Salwatti shore. On the opposite side of the strait similar anchorage may be found in East harbour, but there is only a depth of 4 to 5 fathoms in the entrance, which is immediately north of three small islets lying close in towards the New Guinea shore, and between them and a larger one. When the three small islets are passed, the depth will increase to 7 fathoms, in which a vessel may anchor. A village stands on an islet east of this harbour near the New Guinea shore. The coast consists of limestone, covered with dense wood, and fringed by mangrove swamps.

Tides.—In Selé strait it is high water full and change at 6h.; rise of tide 4 to 6 feet.

In West harbour, one high, and one low water, each of eight hours' duration, were observed in the 24 hours, succeeded by one high, and one low water of four hours' duration; there are, therefore, two establishments of 3h. 15m. and 11h. 30m. (approximately). The flood stream sets to the southward, at the rate of one to 2 knots an hour; the ebb runs northward, not quite so strong.

The strongest stream occurred during the eight-hours' tide, and the feeblest during the four-hours' tide. The highest high water took place after the four-hours' flood, and the lowest low water after the four-hours' ebb. These remarkable phenomena were attributed to the meeting of the tidal waves of two oceans, the northern being the more potent.*

In the broader parts of Selé strait the tidal streams were less strong and took the direction of the strait.

Winds.—In June, the prevailing winds in Selé strait were south-east, force one to 4, and south-west with a force of 3 to 6. The weather, with the exception of a few rainy days, was fine.

Cape Spencer (Sorrong of the Dutch chart), the north-east point of entrance to Selé strait, is of moderate height; reefs project to a distance of about three-quarters of a mile from the cape, as well as from Ram (Dom) islet, which lies close westward of it.

Havik reef, the position of which is uncertain, is charted as being situated about $3\frac{1}{2}$ miles W. by N. from Cape Spencer, on the east side of the northern approach to Selé strait.

NORTH COAST of NEW GUINEA.—From Cape Spencer the coast trends about E.N.E. to Cape of Good Hope, the northern point of New Guinea; it is in general high, but in some places is low near the shore. A short distance inland a chain of mountains from 4,000 to 5,000 feet high, and covered with trees, ranges parallel with the coast as far as the north-west part of the great Geelvink bay.

Threshold point, 13 miles E.N.E. of Cape Spencer, is the western point of a high peninsula which forms the west side of Threshold bay. The western part of this large bay is filled with reefs, but the eastern half appears to be clear, with the exception of a small shoal upon which there is a depth of 6 fathoms; inside this shoal the depth is 29 fathoms. On the north side of the steep east point of the bay are two small cascades of fresh water.

From Threshold bay eastward there are soundings of 20 to 60 fathoms in many places within one or two miles of the shore, but from Brebes and Sedaria points reefs project to a distance of 2 miles; about $2\frac{1}{2}$ miles N. by W. $\frac{1}{2}$ W. from the latter point there is a breaking reef, inside which there is a passage with depths upwards of 10 to 15 fathoms. There is anchorage off Maar village in the bay southward of Brebes point, at about half a mile from the shore.

Mios Sayu or Mispalu islands are two small low islands lying north-west and south-east of one another—each surrounded by a reef; they are separated by a channel about a mile wide, in which there is a depth of 35 fathoms. The outer island, Amsterdam, lies about 4 miles

* Captain von Schleinitz, June 1875.

See plan, No. 1,416 [3,190], and chart, No. 942b [2,558].

from the New Guinea coast; a very shallow reef, about three quarters of a mile broad, extends from the west and south-west coasts of this island to a distance of $2\frac{1}{2}$ miles; great care is therefore necessary in approaching Amsterdam from the southward. The depth of water between the inner island, Middleburg, and the coast is 8 to 10 fathoms, and vessels can anchor southward of the island. There are depths of 15 to 40 fathoms, sandy bottom, at 3 to 4 miles off the coast between Middleburg and the cape of Good Hope, where there is anchorage in case of necessity.

Cape of Good Hope (Kain Kain Beba), 15 miles east of the Mios Sayu islands, is the northern extremity of New Guinea; it is whitish in colour, low, bare, and steep-to. From this point the coast trends about E. by S. $\frac{1}{4}$ S. for 95 miles to cape Mamori, the west point of Geelvink bay, with several indentations in it.

Coast.—False cape, or Tuft point, 11 miles eastward of cape of Good Hope, somewhat resembles it, but has a broader appearance and rises more abruptly from the sea. Cape Maganeki lies 31 miles E. by S. $\frac{3}{4}$ S. from False cape, with cape Ruwe or Maiani about midway between; eastward of cape Ruwe there is a reef near the shore. Between cape Maganeki and cape Boroep, 28 miles E. by S. $\frac{1}{2}$ S. from it the coast forms a deep bay, with cape Mombani situated about midway between the other capes; in the middle of the eastern portion of this bay there is a reef about 2 miles off the shore, with a depth of 20 fathoms inside it.

Cape Ignisui, Little Geelvink bay, is situated about 12 miles eastward of cape Boroep; Oiori river lies about midway between these capes, and on either side of the river mouth, at a distance of about 3 miles, reefs are shown on the chart.

Little Geelvink bay is situated about 25 miles westward of cape Mamori, and 10 miles eastward of a remarkable conical hill near the shore in the vicinity of cape Boroep; it affords anchorage with shelter from north-east and easterly winds in a depth of from 10 to 20 fathoms, with the north extreme of the bay bearing about N. by W. distant half a mile. The water shoals quickly to 5 and 3 fathoms, but it is deep close off the point; a stream discharges on the south side of the bay. There are rocks on each side of the entrance. A fresh-water river enters the head of the bay.

Geelvink bay, with islands in it, are described with the coast to the eastward in *Pacific Islands Directory*, Vol. I.

CURRENT.—On the north-west coast of New Guinea near the equator and in about longitude 132° East, a set to the northward of $4\frac{3}{4}$ miles an hour was experienced for 10 consecutive hours. Eastward of this position to Dampier island and Astrolabe bay the current was found setting to the westward in the month of May at the rate of from 12 to 48 miles day.

Tides.—Little information has been gathered about the tides, but high water and low water occur twice in the day.

WINDS and WEATHER.—The most favourable months for the navigation of the north coast of New Guinea are said to be July and August; as, however, sailing ships continually make the passage during the turning of the monsoon in March and April, or October and November, no reliable information can be supplied. The so-called East monsoon prevails from April to September; the most dominant wind is then from South to S.W., so that it might be more appropriately called a South monsoon. During this period there is the greatest rainfall, and it is known as the wet season. The West monsoon prevails from October to March, with north-westerly winds.

Almost everywhere, even during fine weather, there is a swell from the N.N.E.

WEST COAST of NEW GUINEA.—From English point, the western extreme of New Guinea, the coast trends generally in a S.E. by E $\frac{1}{2}$ E. direction for 95 miles to McCluer inlet; little is known of it beyond such particulars as are given on the chart, and these cannot be said to be trustworthy. The coast is low, fronted by several small islands and detached banks, and must be approached with caution. The native name of this district is Nottan.

Islands between Misol and New Guinea.—Off the north coast of Misol there are several islets which extend across the channel between that island and Salwatti, leaving, however, a clear passage north of them towards Pitt strait. The Vienna and Nosela islands lie north of the northern end of Misol, and between these and Salwatti is a group named Schildpad or Turtle islands, surrounded by reefs, with two small islands south of them named Vetter Pisani. All this region is quite unexplored.

Hesketh shoal was sailed over by the English yacht *Goshawk* in 1875. From the shoal part where bottom was seen, and the depth $2\frac{3}{4}$ fathoms obtained, Schildpad north island, the largest and highest of the group, bore N. by E. $\frac{1}{2}$ E., distant 5 or 6 miles; the next east of the lead gave 5 fathoms, and shortly afterwards, no bottom was found at the depth of 17 fathoms.

Pinon island (West Brother), lying S.S.E. $\frac{1}{4}$ E. 23 miles from English point, is a strip of coral sand, about $2\frac{1}{2}$ cables long and three-quarters of a cable wide; it is covered with high trees and partially surrounded by a semi-circular coral reef, open to the north-west.

With south-easterly winds, good anchorage is found at the open side of the coral reef, in a depth of about 14 fathoms, the middle of Pinon

island bearing S.E. The depth decreases gradually towards the island at 10 fathoms and then suddenly shoals to 2 or 3 fathoms.

False Pisangs and Seven islands.—The False Pisangs appear on the Dutch chart as the easternmost of a range of islands and scattered rocks extending eastward for about 55 miles from the south point of Misol; Daram the outer island is 409 feet in height. The rocks northward of Daram are fantastic in form and steep-to, the largest is 275 feet high; some of these rocks are connected by coral reefs, between others there are depths of 30 and 40 fathoms. The *Gazelle*, in 1875, passed at a distance of 10 miles from the charted position of the False Pisangs, but they were not seen, while the Seven islands, about 12 miles to the N.W., were visible when passed at a greater distance. These groups are therefore probably incorrectly placed on the chart.

Sabuda island and Pisang islets are situated about 25 miles westward of the southern entrance point of McCluer inlet; Sabuda island is moderately high with undulating contours, and wooded. The Pisang islets are lower, with less even contours, and appear from the southward as three large hilly islets, and a few small rocks, the whole covered with vegetation.

McCLUER inlet, so named after Lieut. McCluer, who sailed up it in 1791, is known as Telok Berau by the natives. It is an extensive gulf which reaches to within 12 or 13 miles of Geelvink bay, thus almost insulating the north-west part of New Guinea. Its southern shores, including the small bays and anchorages on its west part, were examined by the officers of the German war-vessel *Gazelle*, in 1875, and by Mr. Hartog of the Dutch steamer *Egeron* in 1877. The description following is taken from the report of the *Gazelle*.

The north shore of McCluer inlet was not examined by the officers of the *Gazelle*; it appears to consist of low land covered with mangroves, with a range of hills about 300 feet in height behind; a second range, of from 1,600 to 2,000 feet in altitude, being situated farther back. All the islands, as well as the coast of McCluer inlet, consist of limestone formation, the surface of which is just sufficiently decayed to favour luxurious vegetation.

Soundings.—Close to the south side of the entrance the soundings are from 30 to 49 fathoms, but further northward the depths vary between 15 and 25 fathoms. Caution should be used in approaching the shoal parts of the coast of McCluer inlet, as mud banks having from 2 to 3 fathoms over them extend from the shore in many places. In the vicinity of the 2 to 4-fathoms bank lying some 12 miles off the coast about 20 miles eastward of Oger island, there are depths of 3 fathoms at the distance of 3 miles from the shore.

Tatingar point is the western extremity of Three Capes peninsula on the south side of McCluer inlet. The peninsula takes its name from its terminating to the westward in three capes much resembling each other, the central and highest one being 650 feet in height. Behind the point the wooded land rises to an elevation of 1,640 feet, and thence a chain of hills about 2,000 feet high extends to the eastward.

Wass islet, lying close off the village of Ati Ati, at about 4 miles north-eastward of Tatingar point, is rocky and covered with bushes, and vessels must pass north of it. Vessels can anchor in a depth of 20 fathoms, sand, on its west side, with the north point bearing between N.E. by E. $\frac{1}{4}$ E., and E.N.E., protected from the south-east winds; also off the centre of the east side, in 15 fathoms, protected from south-west winds.

Patippi bay.—From Wass islet the coast trends 14 miles E. by N. with several small indentations, forming the south side of Patippi bay about 7 miles in extent by 4 miles in greatest width, which is sheltered on its northern side by the steep Brousing peninsula, rising to a height of 328 feet. The entrance is $1\frac{1}{4}$ miles wide, and the depths within are from 7 to 10 fathoms, affording anchorage protected from all winds. A few islets lie off the shore, which is thinly inhabited by peaceful natives.

Islands off cape Salikiti and Segaar bay.—From cape Salikiti, the north-west extreme of Breusing peninsula, the limestone coast trends 12 miles eastward to Segaar bay, and has two small wooded islets off it, with deep water near the shore. Off Segaar bay a chain of wooded islands and islets extends for a distance of 10 miles, lying parallel with the coast. West islands, a small group at the western end of the chain, consist of one large and a few small islets, and south-east of these are the numerous Surega islets. Oger island, the largest of the chain, follows next; Pigeon channel separating it from the shore is encumbered with islets, but a passage, with depths of 12 to 17 fathoms, passes close along the east side of Oger island, between it and the East islands into Segaar bay. East islands consist of one island and numerous islets, with depths of over 7 fathoms between them and the shore. Large vessels can anchor off a village in a bay on the south side of the most eastern and largest of the East islands, sheltered from westerly winds.

SEGAAR BAY, which extends about 3 miles inland, terminating in a brackish rivulet, is sheltered from the northward by the above described chain of islands and islets, and there are several islets within the bay. Entrance peninsula, on the west side, hides the bay from seaward, but on approaching it may be easily recognised by its bluff points, 60 to 80 feet high, with some islets close to. A $3\frac{3}{4}$ -fathoms bank extends from the south shore to the middle of the entrance, with anchorage off its extremity in a depth of 5 to 7 fathoms, sheltered from all but W.N.W. winds. The

See plans of Patippi and Segaar bays, on plan, No. 1,416 [3,190].

shores of Segaar bay are densely wooded, and there are several villages, genrally built on piles 6 to 7 feet above the level of the water. Completely sheltered anchorage will be found in Gazelle harbour, the bight on the south-east side of Entrance peninsula, which can be approached by passing west of the shoal, and within $1\frac{1}{2}$ cables of the peninsula, in depths of 5 to 8 fathoms. When past the shoal, steer with caution towards the village of Sisir, on an islet on the south side of the harbour, and anchor in $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms, mud, good holding ground, with the south point of the peninsula bearing between N. and N.W. by N., and the village between S.W. and S.W. by W.

Communication.—The steamers of the Netherlands India Company, from Banda and Gisser, touch at Segaar bay once in 3 months; see page 30. The bay is also frequented by Malay praus and Chinese traders.

Tides.—It is high water, full and change, in Segaar bay at about 6h. 30m. (approximate). Rise and fall of tide, from 4 to 6 feet. The flood and ebb streams run at the rate of from a half to one knot an hour. In McCluer inlet the streams follow the direction of the coast.

South coast of McCluer inlet.—From Segaar bay the south coast of McCluer inlet trends east for 11 miles, with several villages on it and deep water close-to. It is steep and about 400 feet high; and inland the hills rise to a height of 1,300 to 2,000 feet. Here the coast turns to the south-east, and then curves to the north-eastward for a total distance of 15 miles, the shore becoming low and bordered by extensive banks of mud, which must be approached with caution. A crescent-shaped bank, $12\frac{1}{2}$ miles in length, lies from 8 to 12 miles off this coast, with depths of 2 to 4 fathoms on it, and 4 to 10 fathoms between it and the shore bank. The northern part of this coast is formed of low mangrove land, with numerous brackish creeks.

Jeschke river.—The head of McCluer inlet opens out into an inner inlet about 35 miles long, east and west, and 12 miles wide, with low shores intersected by numerous creeks, and fronted by extensive banks of mud, with depths of 5 to 20 fathoms between them. On the south side there are two deep indentations, probably the mouths of rivers.

Jeschke river, probably the same as Jakati, which enters the head of the gulf or inlet, is 4 to 5 fathoms deep at the mouth; the lower reach can be followed up in an easterly direction for about 5 miles, when two branches of the river will be seen, one to the N.N.E., the other to the S.S.E., both of them navigable beyond the junction. To enter:—Mount Credner, a hill on the north side of the river, about 330 feet high, should be steered for on an E.N.E. course until the mouth of the river bears East; the course may then be altered direct for the mouth.

See plan, No. 1,416 [3,190], and chart, No. 942b [2,558].

COAST.—Between Three Capes peninsula and cape Sapei, which lies S.E., 58 miles from the former, the coast forms a wide bight, in which are lesser bays fronted by islands; in appearance it is rugged and cliffy, but it has not been examined. The native name for this district is Onin. The coast and islands between Tatingar point and Panjang island are reported to be charted from 4 to 6 miles too far East.

Gide island or Batu Puti $1\frac{1}{2}$ miles long east and west, situated near the southern cape Batu Mafutiri, may easily be mistaken for that cape, as on coming from the southward it does not appear separated from the mainland. The contours of the island are more broken than those of the peninsula, and it is not so high.

Alexandra and Freshwater bays, which lie immediately eastward of Batu Mafutiri, were examined by Signor Cerruti and Captain Di Lenna in 1870. They are each about 2 miles wide, and are separated by a thickly wooded peninsula, on the east side of which the *Alexandra* anchored opposite a cascade of fresh water. In Di Lenna's map the depth of water at the anchorage is $2\frac{1}{2}$ to 5 fathoms, and in the middle of the anchorage there is a shoal about a third of a mile from the shore.

Ekka island, about $1\frac{1}{2}$ miles long east and west, is narrow and lies about 6 miles south-eastward of Batu Mafutiri; the village of Ati Ati is on its northern shore. A rocky shoal extends about $2\frac{1}{2}$ cables from the east point of Ekka; between the island and the mainland there are three small islets standing on an extensive shoal.

Acha Tuning is a trading village on the mainland opposite to the west end of Panjang island; the chief export is wild nutmegs. The anchorage off Acha Tuning appears to be indifferent, and in deep water. A reef extending to the distance of about one mile eastward from the point situated westward of the roadstead is marked at its eastern extreme by a beacon; the edge of the shore reef off the village is similarly marked. At Acha Tuning there is a freshwater stream.

About $3\frac{1}{2}$ miles eastward of Acha Tuning, distant half a mile from the coast, there lies a small reef, with a least depth over it of 2 feet, from which Fak Fak flagstaff bears N. 71° E., distant $2\frac{3}{4}$ miles.

Fak Fak, a village of some importance situated 6 miles eastward of Acha Tuning, and nearly abreast of the east end of Panjang, is built against and upon a plateau on a point of the same name, and can be recognised by the flagstaff; the landing is at a small pier in the inner bay, from whence a path to the village is cut in the rocks. At this place, within the district of Kapau and belonging to the Ternate Residency, is the seat of the civil governor. The anchorage is in a depth of about 30 fathoms, mud, at the distance of 3 cables from the shore, with the flagstaff bearing N. by E. The coast reef extends off about $1\frac{3}{4}$ cables.

The former inhabitants of Serang island have almost all removed to Fak Fak. A steamer of the Netherlands India Steamship Company calls here once in three months; see page 30.

South-west of Fak Fak, at the distance of one mile, and westward of the above anchorage, lies a reef about half a mile in extent; it is steep-to and between it and the shore, which is fringed with reef, there is a deep passage.

Serang island, $1\frac{1}{2}$ miles south-east of Fak Fak, is surrounded by the shore reef which, at this part, projects out to the distance of 9 cables.

Panjang island, $6\frac{1}{2}$ miles in length, is situated eastward of Ekka island, and lies in front of Kapau bay; the western end of the island is bordered by a reef, which appears to project about one cable.

Danger.—A shoal, having less than 6 feet water over it, is shown on the chart as lying 7 miles south of Panjang island.

Patimuni point, 23 miles south-east of Fak Fak, is high and bordered by reef; the chart shows a patch with less than one fathom over it 3 miles west of the point.

Charles Albert archipelago is the name given to the islands near Patimuni point. Semai, the northernmost, lies 4 miles north-west of the point; it is 6 miles long north-west and south-east, and hilly. A reef, having a depth of 2 fathoms over it, lies 3 miles north-west of the north-west point of Semai. Karas Kani lies south of Patimuni point; it is 8 miles long north-west and south-east and 1,200 feet high, with a hill at each end. Eastward of it are two smaller islands Tuburuasa and Batur, and an islet, with depths of from 25 to 42 fathoms between them and Karas Kani, the deep water running close in to the shores, which are steep-to.

A reef with a depth of $3\frac{3}{4}$ fathoms, lies 3 miles north-west of the north-west extreme of Karas Kani, with Patimuni point bearing N. by E. distant $10\frac{1}{2}$ miles.

Cape Sapei or Baik is the north-west point of Orange Nassau peninsula (Kumawa); northward and north-eastward of the cape the coast is foul to the distance of 3 miles. From cape Sapei the coast trends S.S.E. $\frac{1}{2}$ E. for 28 miles to cape Kaffura, the south-west point of the peninsula; the land between the capes reaches a height of 3,000 to 4,000 feet near the shore, but the peaks are usually hidden in clouds. The islands Katumi, Vulcan, and others lie near the shore midway between the two capes.

Cape Kaffura is a high bold headland composed of limestone. Ruloff islands are three small high islets lying 4 miles E. by S. of the cape. Discoloured water (probably marking a shoal) was seen by the *Sireen* in 1832, with cape Kaffura bearing N.W. $\frac{1}{4}$ W. and the point to the eastward N.E.

ADI ISLAND, with its north-west extreme situated 26 miles east of cape Kaffura, is 28 miles long W.N.W. and E.S.E.; it is of coral formation, and only 50 feet high in the centre. Several shoals and sunken reefs

See chart, No. 9426 [3,558], and plan, No. 1,416 [3,190].

lie north-east of Adi to a distance of 6 miles from the shore. A coral rock about one cable in extent, with a known depth of 5 fathoms over it and probably less, lies with the east extreme of Adi bearing S.S.E. $\frac{1}{2}$ E. distant 9 miles, and the north-west extreme of the island W. by N. Off the middle part of the north-east side of the island good anchorage may be found in a depth of 6 to 10 fathoms, mud, at the distance of $1\frac{1}{2}$ miles from the shore, and closer to it in a lesser depth. About 5 miles to the southward of the western point of Adi there is a small bay affording anchorage in a depth of 10 or 11 fathoms. Tumbu Tumbu, or Bird islet, lies 5 miles south of Adi and about 10 miles from its east point; reefs project north-westward and south-eastward of this islet to the distance of $1\frac{1}{2}$ miles.

Nautilus strait, separating Adi island from the main shore, is 5 miles in width, with depths of 8 to 10 fathoms in it. Between the north point of Adi and Urobie islet the channel is only $2\frac{1}{2}$ miles wide.

Kamrau bay (Arguni) is an extensive indentation in the coast north of Adi island. The coast of this bay is also indented with numerous smaller bays, and near its centre lie two small islets, **Karawata** and **Keliwala**, with a sunken rock midway between them and deep water around; a shoal, with a least depth of $3\frac{1}{2}$ fathoms on it, lies N.W. $\frac{1}{2}$ N. distant $3\frac{3}{4}$ miles from Karawata. Reefs appear to extend for 4 or 5 miles off the western shore with some islets on them, and in the northern part of the bay are several other islets; a shoal with a least depth of $3\frac{3}{4}$ fathoms on it, lies S.W. by S., distant 3 miles from Semora point on the western side of entrance to **Kaimana bay**. The river **Karufa**, which is 100 yards wide at the mouth, debouches on the western shore; there is anchorage off the mouth, but caution is required to avoid the shoals. There is also anchorage in **Kaimana bay** in a depth of 6 to 8 fathoms; a stream of fresh water discharges itself here.

At the head of **Kamrau bay** a narrow passage gives access to a basin about 5 miles in diameter, and from this basin another narrow channel leads north into a large sheet of water, named on the chart **Arguni bay**; these bays and **Karufa river** were examined by the boats of the *Etna*.

Uru Languru or Triton bay is an inlet extending 9 miles north-eastward into the mainland, having two islands on the north side of the entrance, and several islets farther in. The shores are mountainous. A chain of five small islands stretches westward from the west point of **Aiduma**, and the fairway channel lies between the outermost of these and **Semieuw islands**, 3 miles to the north. **Dubus haven** is a cove on the north side of **Triton bay** which is 2 miles deep to the north-west, and with half a mile navigable width, having at the entrance a depth of 25 fathoms, which decreases to 5 fathoms, mud, at its head, where a vessel may moor one cable's length from the shore off the ruins of the old Dutch fort. The

channel into the cove is close to the south-west side, as a mud-bank, nearly dry at low water, extends from the north-east side, three-fourths of the width of the cove.

Tides.—It is high water, full and change, in the cove in Triton bay at 1h. 8m.; rise at springs 7 feet; the greatest rise is at the quarters, when the range is nearly 8 feet. There are two high and two low tides in the 24 hours.

Aiduma island, on the eastern side of the entrance to Uru Languru, is 9 miles long W.N.W. and E.S.E.; from the western point, as stated above, a chain of islets extends 5 miles to the westward. There is anchorage in a bight on the north-east side of Aiduma, in a depth of 25 fathoms at a cable's length from the shore, and opposite a fertile valley, in which there is a native village.

Iris strait (Saraweri), the channel by which the schooner *Iris* entered Uru Languru bay, is between Aiduma island to the south, and Dramai island and the mainland of New Guinea to the north. The strait is, generally speaking, from one to 2 miles wide, but is contracted to less at both ends. The *Iris* had no soundings in mid-channel with 70 fathoms of line.

Kaju Mera island and bay.—Kaju Mera island, about 4 miles long east and west, and 1,600 feet high, lies 6 miles eastward of Aiduma; islets stretch out from its north-west and south-west points leaving a narrow deep channel close along the mainland into Kaju Mera bay. Eastward of Kaju Mera island, the passage to the bay, $1\frac{1}{2}$ miles in width, and which is also deep, has three small steep-to islets in the centre of it.

Kaju Mera bay, about 6 miles in length W.N.W. and E.S.E., and 3 miles deep, appears to be clean except for the fringing banks of mud and sand, which in places extend out to the distance of half a mile; but a reef projects three-quarters of a mile south-eastward from a small peninsula at the north-west end of the bay. Anchorage may be found in depths of from 10 to 20 fathoms, mud or sand, along the shores of the bay, at a moderate distance from the fringing bank.

Lakahia bay, and Etna or Kiruru bay.—Lakahia bay has its entrance between cape Awura and cape Bohia 8 miles to the east-south-east; a reef extends westward $2\frac{1}{2}$ miles from the latter cape. Three miles north-west of cape Bohia is Lakahia island, $1\frac{1}{2}$ miles long north-east and south-west, surrounded by a reef, which, spreading out to the breadth of one mile, extends for that distance south-westward. The bay first trends 10 miles to the north-east, and then turns sharply to the eastward for a further 16 miles; this inner extension is known as Etna or Kiruru bay. The eastern side of Lakahia bay is entirely occupied with an extensive bank covered by one to 3 fathoms water; the channel to Etna or Kiruru

bay lies close along the western shore, and is about half a mile wide with a depth of from $3\frac{1}{2}$ to 15 fathoms. There is anchorage about half a mile northward of Lakahia island in a depth of 7 to 10 fathoms.

Etna or Kiruru bay is a narrow land-locked estuary entered from Lakahia bay between two steep-to projections of the coast; there is anchorage throughout its length in a moderate depth of water. The shores of the bay appear to be clean, and the only known danger is a reef, half a mile in extent, about 9 miles within the entrance; the fairway here is close to the point on the southern shore.

The district, including Kiruru and Uru Languru, is known as Kowai.

Vlakke point.—From cape Bohia the coast trends about E.S.E. for 41 miles to Vlakke point, a steep foreland visible at a distance of 30 miles; this district is known as Kapia. A high range of mountains, named Charles Louis mountains by D'Urville, traverses this part of New Guinea east and west for a distance of 180 miles; its most western peak being mount Lakahia, 4,564 feet high, near the coast 25 miles north-west of Vlakke point.

Coast.—From Vlakke point the coast trends E. by S. for 81 miles as far as cape Steenboom, and throughout that length is low and densely wooded, presenting from the sea a monotonously uniform appearance relieved only occasionally here and there by gaps, probably indicating the mouths of rivers. As far as is known of this part of the coast it is not dangerous, except at cape Steenboom, which is fringed by a reef to a distance of 2 miles.

The Utanata river, which enters the sea 13 miles north-west of cape Steenboom, is about 2 miles wide at its mouth, and is fronted by a bar on which there is 6 feet at low water; within the bar there are depths of 4 to 7 fathoms to a distance of 8 miles up the river. A very heavy sea breaks on the bar during the south-east monsoon; during the north-west monsoon trading prahus from Ceram visit the river, exchanging rice and cloth for *masoi* (a fragrant bark). The best anchorage is about 3 miles westward of the mouth of the river in a depth of 6 to 8 fathoms, mud; this position is more secure during the south-east monsoon than in the opposite season, as the coast supplies partial shelter; but with a persistent south-east wind a heavy swell sets in. The Wamuka river, a similar but smaller river, enters the sea 4 miles to the north-west of the Utanata, and is, like this latter, fronted by a bar.

Tides.—The range of the tides off the mouth of the Utanata is 7 to 9 feet. The flood stream sets to the E.S.E. and the ebb to W.N.W.; the streams are, however, irregular, and are influenced by the current out of the river.

Pisang bay, to the eastward of cape Steenboom, is fronted by several shoals, the outermost of which lies E. by S. 10 miles from the cape; there is also a bank with a depth of 6 fathoms upon it, situated S.E. $\frac{3}{4}$ E. 15 miles from cape Steenboom. Two large rivers debouch on the southern shore of the bay; they are fronted by sand-banks on which, during the south-east monsoon, there is a heavy surf; a reef lies 6 miles south-west from the entrance of the northern river. A vessel can anchor in a depth of 13 fathoms off the bar of the southern river, but a swell from the southward and the banks which lie to the north-west render this anchorage unsafe in the south-east monsoon.

Coast.—From Pisang bay the coast trends E.S.E. for 90 miles, and then S.S.E. for 115 miles as far as the northern entrance to Dourga strait; throughout the whole of this distance the coast is low and richly wooded; no high land whatever can be seen from a vessel south of latitude 5° S. The mud-shore is so shelving that vessels cannot approach the coast within 4 to 8 miles; it can be approached nearest about lat. $6^{\circ} 15'$ S. where there is a village which was visited by Captain Cook in September 1770. The district eastward of Utanata was said by the people of that place to be named Timakawa or Timoraka.

Two banks are shown on the chart; the one 10 miles S.E. of the easternmost large river above mentioned, and 5 miles off shore, the other 20 miles S.E. by E. of the river and 10 miles from the coast. The north-west and south-east monsoons prevail along this coast with some modifications as to their direction; the south-east monsoon being the rainy season, and the north-west monsoon the fine season.

Tides.—The *Triton*, when at anchor at various places during four days in May 1828, found the tidal streams setting alternately towards north-east and south-west at a rate of 2 miles an hour—but whether these were flood and ebb, or ebb and flood streams respectively, is not stated. The rise and fall was 10 to 13 feet.

Providential bank lies approximately in lat. $5^{\circ} 38'$ S., long. $137^{\circ} 55'$ E., its outer edge being about 16 miles from the mainland. The depth of least water over it is unknown,—4 fathoms was struck on the bank, 6 to 9 fathoms was obtained immediately south of it, and 12 fathoms 2 miles to the westward.

Triton bank lies in lat. $6^{\circ} 0'$ S., long. $138^{\circ} 4'$ E., its outer edge being about 23 miles off shore; 4 fathoms was struck on it, and there is 10 fathoms, mud, immediately south of it. The *Dourga*, in 1826, obtained soundings on a bank, the centre of which, with only $1\frac{1}{2}$ fathoms over it, was placed by Lieut. Kolff in lat. $5^{\circ} 55'$ S., long. $138^{\circ} 0'$ E.; it may be that this is the Triton, or Providential bank.

Kolff bank.—The *Dourga*, in 1826, passed over a small patch of hard sand with 8 fathoms over it, the depth around being 19 or 20 fathoms, mud. The position of this shoal in Lieut. Kolff's narrative is lat. $7^{\circ} 0' S.$, long. $136^{\circ} 4' E.$, but in the chart prepared by that officer the longitude assigned is $136^{\circ} 48' E.$

Frederick Henry island, the south-westernmost part of New Guinea, is only separated from the mainland by Princess Marianne, or Dourga strait. The island is about 90 miles long E.N.E. and W.S.W., and 60 miles wide, north and south, at the eastern part, but tapers to a narrow point at cape Valsche, its western extremity. The land is everywhere low, apparently marshy and covered with a dense forest. The entire south and north-west coasts are fronted by a mud-bank extending about 8 to 12 miles from the shore with 3 fathoms on its outer edge, from which the depth increases gradually to 9, 14, and 27 fathoms. About 50 miles north-east from cape Valsche the shoal facing the northern side of the island decreases in breadth, allowing of a nearer approach to the shore.

Dourga strait.—The northern entrance of Dourga or Marianne strait is 10 miles wide with a depth of from 8 to 11 fathoms; the width as well as the depth gradually decreases and the strait becomes narrow at the southern part, carrying from 8 to $2\frac{1}{2}$ fathoms to the exit. The southern entrance is less than 2 miles wide, and is faced by a bar over which there is a depth of 2 fathoms. No danger was encountered by the Dutch ships in 1835 when beating through the strait.

Water.—There is a creek about 5 miles within the northern entrance, in which the water is fresh at three-quarter ebb; but a vessel would find it difficult to water there.

Tides.—During the passage of the schooners through the strait, 26th April to 9th May 1835, two flood streams and two ebb streams in 24 hours were observed at the entrance, but within the strait there was but one flood and one ebb stream. The former set to the south, and the latter to the north at the rate of 2 to $4\frac{1}{2}$ miles an hour. The rise and fall was 12 to 16 feet; time of high-water not stated.

Cape Valsche or False cape, the western extreme of Frederick Henry island is, according to Lieut. Kolff, in lat. $8^{\circ} 22' S.$, long. $137^{\circ} 40' E.$ The mud-bank which faces the coast here extends 10 miles to the westward, and for 15 miles in a S.W. by W. direction; at the distance of 5 miles further westward the depth is 5 fathoms, and much discoloured water has been observed. As this locality has never been surveyed, and as the astronomical position of cape Valsche, and the extent of the bank is very doubtful, mariners should exercise much caution, and give the point a good berth.

CHAPTER XIV.

ARAFURA SEA, AND APPROACHES TO PORT DARWIN.

 VARIATION 2° 30' East in 1902.

This chapter treats of the Arafura sea, and of that part of the north coast of Australia which is included between De Courcy head to the east, and Anson bay to the west. The approaches to Torres strait will be found in the Australia Directory, Vol. III.

The ARAFURA or TIMOR SEA, that part of the Indian ocean extending from Torres strait to the island of Timor, is bounded to the southward by the northern coast of Australia, and to the northward by part of the south-west coast of New Guinea and the chain of islands lying between it and Timor.

This sea being little known beyond the routes generally taken by vessels from Torres strait towards Timor, and between Torres strait and port Darwin, it is probable that shoals exist in addition to those marked on the Admiralty charts. As the positions and even the existence of some of these are doubtful, a vigilant look-out should be kept, with the view of removing these doubts, as well as for the safety of the vessel.

Soundings.—The greater part of this sea has a depth of less than 100 fathoms. In proceeding westward from Torres strait the soundings increase regularly from 9 fathoms near Booby island, to about 30 fathoms between cape Valsche in New Guinea, and cape Wessel in Australia; thence the soundings increase in depth more rapidly to 100 fathoms when about midway between the Aru islands and cape Croker, and to 645 fathoms 15 miles south of Timor Laut. A lesser depth of water, however, continues along the north and north-west coasts of Australia, and the 100-fathoms contour-line can be traced from the above position midway between the Aru islands and cape Croker, westward as far as the Sahul bank, 50 miles south of Timor, and then south-west gradually approaching the Australian coast.

The depths over this Australian bank are mostly between 40 and 60 fathoms, and to the eastward of the meridian of Dundas strait, are fairly regular; to the westward of that line they are irregular, from 20 to 70 fathoms with patches of less than 20 fathoms, and are especially irregular near the edge of the bank, where various shoals have been found. Other shoals probably exist, and a good look-out should therefore be kept in navigating these waters.

See chart, No. 2,759a [2,977].

DANGERS in the MAIN TRACK OF VESSELS.—

The **Sahul bank**, said to extend from the meridian of 126° E. to 124° E., and from the parallel of $10^{\circ} 50'$ S. to 12° S., and to consist of banks of sand and coral rocks with depths ranging from 10 to 16 fathoms, is out of the scope of this work; a description of it will be found in the *Australia Directory*, Vol. III.

As the Sahul bank has not been surveyed, it should be avoided, or passed with caution.

Troubadour shoal, in lat. $9^{\circ} 44'$ S., long. $128^{\circ} 30'$ E., has a depth of 9 fathoms, and at about S.E., 13 miles from it H.M.S. *Fly* discovered a shoal with 12 fathoms, sand and reddish coral.

Flinders shoal is circular in shape, and $1\frac{1}{2}$ miles in diameter, and has a general depth of 6 to 8 fathoms, coral. The shoalest part, with 5 fathoms over it, is situated in lat. $9^{\circ} 52\frac{1}{4}'$ S., long. $129^{\circ} 17'$ E.

Franklin shoal is circular in shape, and one mile in diameter, with a general depth of 6 to 8 fathoms over coral. The shoalest place, with 5 fathoms on it, is situated in lat. $9^{\circ} 52\frac{1}{4}'$ S., long. $129^{\circ} 19'$ E.

Blackwood shoal is about 6 cables in diameter, with a general depth of 8 to 14 fathoms, coral bottom. The shoalest spot, of 7 fathoms, lies in lat. $9^{\circ} 53'$ S., long. $129^{\circ} 25'$ E.

Evans shoal extends $4\frac{1}{2}$ miles N.N.W. and S.S.E., with a breadth of 3 miles, and has a general depth of 8 to 16 fathoms. The shoalest part, with 5 fathoms on it, coral bottom, lies 4 cables from the north extreme, in lat. $9^{\circ} 53'$ S., long. $129^{\circ} 32\frac{1}{4}'$ E.

There are quantities of snakes and sea perch on these banks.

Caution.—It is probable that many other shoals exist on or near the same parallel of latitude, both eastward of Evans shoal and westward of Flinders shoal. The four shoals above mentioned are probably part of a submerged barrier lying along the edge of the bank. Northward of them the character of the bottom changes to globigerina ooze.

Lynedoch bank is a coral shoal, about one mile in extent, with 7 fathoms water on it, in lat. $9^{\circ} 54'$ S., long. $130^{\circ} 40'$ E.

Victoria shoal, reported to have only $4\frac{1}{2}$ feet water over it, and to be situated in about lat. $9^{\circ} 13'$ S., long. $131^{\circ} 24'$ E., having been unsuccessfully searched for by H.M.S. *Rambler* 1887, and again by H.M.S. *Egeria* 1890, has been expunged from the Admiralty charts; "Site of Victoria shoal unsuccessfully searched for" has been placed near the position.

Current.—During the above search by H.M.S. *Egeria*, the current on the night of 2nd October 1890 was observed to run to the westward,

See charts, Nos. 942a [2,557] and 1,044 [2,983].

at the rate of half a knot per hour; and during the day, 3rd October, to the north-westward, at seven-tenths of a knot per hour.

Indus reef, reported by the commander of the steam vessel *Indus* in 1884, to be about one mile in extent, with very little water over it, and to be situated approximately in lat. $10^{\circ} 17' S.$, long. $131^{\circ} 6' E.$, has been erased from the charts; a search, in fine weather, over an area of 120 square miles in this vicinity has been made without any indication of shoal water being obtained.

Money shoal is of coral formation, very flat, about $3\frac{1}{2}$ miles in extent W.N.W. and E.S.E., and $1\frac{1}{2}$ miles in width. It has a general depth of $4\frac{1}{2}$ to 5 fathoms over it, and several patches of 3 fathoms on its eastern edge, the easternmost being in approximately lat. $10^{\circ} 21\frac{1}{2}' S.$, long. $132^{\circ} 46' E.$, and about N. by E. 38 miles from cape Croker. During fresh easterly winds the shoal has been seen to break.

Tidal streams.—At Money shoal the rising stream sets W.N.W. at the rate of half to one knot an hour, and the falling stream S.E. from half to three-quarters of a knot; the streams are much influenced by the prevailing easterly winds, which cause, at times, a general set to the westward.

Marie and Parry shoals.—See page 550.

Winds and weather.—See page 16.

TIDES.—The set of the tidal streams in the Arafura sea is not well known, but the streams do not appear to be strong, the current generally setting with the wind. The flood stream enters the sea from the eastward through Torres strait, and from the north-west by the Aru islands—(see page 27). Observations are wanting as to the tides between Timor Laut and Timor; but south of Timor the flood stream sets towards the east. On the north coast of Australia the flood stream sets to the eastward between cape Croker and cape Wessel, but in the offing of port Essington and Popham bay it sets to the westward, the flood entering Van Diemen gulf from the northward through Dundas strait, and from the westward through Clarence strait.

NORTH COAST of AUSTRALIA.—Only that part of the coast included in the approaches to port Darwin are treated of in this work; the coast to the eastward of De Courcy head is described in Australia Directory, Vol. III.

De Courcy head.—From Brogden point a rocky coast trends 14 miles north-westward to De Courcy head, a cliffy projection, 117 feet high; whence the rocky shore trends west 3 miles to cape Cockburn, a low rocky point, with ledges extending nearly half a mile north-west and south-west of it. The cape is wooded to within a short distance of the sea, as is generally the case on this coast.

MOUNTNORRIS BAY lies between cape Cockburn and the south extreme of Croker island, and has general depths of 6 to 8 fathoms.

See chart, No. 1,042 [2,984].

Malay bay lies between cape Cockburn and Annesley point, and is 3 miles across; the latter has a reef extending three-quarters of a mile off it. Malay bay affords good anchorage in a depth of 3 to 5 fathoms.

From Malay bay the south-east shore of Mountnorris bay is chiefly formed by sandy beaches, broken by rocky points, but may be approached to the distance of about one mile in a depth of 4 to 6 fathoms. Thickly-wooded hills from 146 to 292 feet in height skirt this and the western side of the bay at about one mile inland.

From the bight of the bay, the western side is encumbered with shoals, extending 4 miles off it, well out into the bay.

Valentia isle, 160 feet high, lies south-west of the entrance of Malay bay; it is 2 miles in length, and thickly wooded, with reefs extending about one mile from its south-east and north-west ends. There is no safe channel between Valentia isle and the south-west point of Malay bay.

Copeland islet, 125 feet high, in the bight of Mountnorris bay, is small, wedge-shaped, and surrounded by a coral reef for the distance of half a mile, with a depth of 7 fathoms on the northern side of the reef, and 4 to 5 fathoms on the remaining sides. On the north side of the islet is a perpendicular cliff of a bright yellow colour, which is a conspicuous object to vessels entering the bay. A sand-bank, with a depth of $1\frac{1}{2}$ fathoms, lies N.W. by N. 3 miles from Copeland islet, connected by shallow water with the mainland 4 miles to the westward of it.

Copeland islet is used by the Malays during the trepang season for boiling and drying out their fish.

Supplies.—Buffaloes have been found plentiful on the low sandy shore in the bight of the bay.

BOWEN STRAIT separates Croker island from the mainland; this strait is about 20 miles in length, one to 4 miles in breadth, and is stated to have a depth of from $3\frac{1}{4}$ to 7 fathoms, and to be encumbered with shoals. The depths mentioned are not borne out by the chart.

A rock, with less than 6 feet on it, lies nearly in mid-channel; other shallow patches lie north and south of it.

Directions.—Bowen strait is said to be available for vessels of 15 feet draught. There is reported to be $4\frac{1}{2}$ fathoms least water eastward of the shoals in the middle of Bowen strait.

Darch isle is about 2 miles in length, thickly wooded, and surrounded by a reef, which projects one mile from One Tree point on its north-east side. There is a narrow channel, with a depth of from 5 to 10 fathoms, between Darch isle and Croker island.

Templer islet, 57 feet high, lies about midway between Valentia and Darch isles; it is small and surrounded by a reef extending about one mile in places, except on its east side.

A shoal, upon which there is a depth of $3\frac{1}{2}$ fathoms, lies midway between Templer islet and Darch isle.

Cowlard islet, very small, and encircled by a narrow reef, lies midway between Templer islet and the entrance of Malay bay.

New Year isle is the north-easternmost of a number of small islands lying off Mountnorris bay; it is one mile in extent, low, wooded, and fringed by a reef.

Bramble rocks, of doubtful position, on which H.M.S. *Bramble* struck in 1843, are reported to lie West 14 miles from New Year isle, and E.N.E. 13 miles from cape Croker, and to have a depth of 12 feet water over them.

Oxley isle, W.S.W. 12 miles from New Year isle, is 2 miles long north and south, and connected by rocks with a small low and wooded islet three-quarters of a mile to the southward of it; a rocky shoal extends about a mile to the northward and eastward.

Banks.—Between New Year and Oxley isles Captain King passed over two coral banks, separated from each other by deep water; it is presumed that the eastern bank, with a depth of 9 fathoms, was the shoal extending to the northward from Oxley isle, and that the western bank, with over-falls between 5 and 7 fathoms, was the south-eastern tail of the Bramble rocks. In all the space for 5 to 8 miles east and north-east of Oxley isle the depths are irregular, of from 5 to 9 fathoms, coral bottom.

McCluer isle, 9 miles southward of New Year isle, is $2\frac{1}{2}$ miles in length, and of triangular shape with the apex to the north-west. A reef with a wooded islet on it projects $1\frac{1}{2}$ miles N. by W. $\frac{1}{2}$ W. from its north-west point, and extends round its north and south-east sides to the distance of one mile from the shore; a 2-fathoms shoal lies at one mile from the south-west side of the island.

Shoal patches are reported to exist in the passage between McCluer and New Year isles.

Grant isle, 6 miles to the south-westward of McCluer isle, and 10 miles north of De Courcy head, is 140 feet high, 4 miles in length east and west, and $1\frac{1}{2}$ miles in breadth. It is surrounded by a reef except off its south-west side. A wooded islet stands on the north-east point of the reef.

Lawson isle, in the space between Oxley, McCluer, and Grant isles, is of triangular form, and about 3 miles in circumference. A reef

extends half a mile from its west and north sides, and to a greater distance eastward, the extremity being $1\frac{3}{4}$ miles E.N.E. of the east point of the island with two wooded islets between.

A low and wooded islet lies at the distance of 2 miles S.S.E. from Lawson isle.

Between this islet and Grant isle there are shoal patches of 4 and $4\frac{1}{2}$ fathoms separated by depths of 7 and 9 fathoms.

Tides.—It is high water, full and change, in Mountnorris bay, at 6h.; springs rise 6 feet.

Caution.—As the space between New Year isle and Mountnorris bay is only partially surveyed or sounded, passing vessels should keep well outside that island and cape Croker, to clear the Bramble rocks and the reef running out from the cape, and also to avoid any undiscovered dangers which may lie between the islands.

Money shoal.—Whilst avoiding the outlying dangers just enumerated off Mountnorris bay, it should be borne in mind that Money shoal, with 3 to 5 fathoms water, lies about N. by E. 38 miles from cape Croker; *see also* page 525.

CROKER ISLAND is 23 miles in length north and south, and from 2 to 6 miles in breadth. Cape Croker, the north extreme of the island, is a wooded point 79 feet high, with a remarkable rocky hummock at three-quarters of a mile southward of it.

The north-west end of Croker island forms a bay extending 9 miles from the cape to a low point, from which a reef, with an islet on it, projects 2 miles to the north-westward. From this point the coast, fronted by reefs, trends south-south-eastward 5 miles to Palm bay.

Palm bay is 3 miles in extent, affording in the south-east monsoon, good anchorage in from 4 to 5 fathoms. The shore is rocky to the distance of one mile, and the two points between which the bay lies have rocky spits.

From the southern point of Palm bay the west side of Croker island appears to be stony and mostly covered with scrub. It forms the east side of Bowen strait.

The southern half of Croker island is wooded, and at its south-east point at the distance of $4\frac{1}{2}$ miles from the southern extremity, the land attains the height of 192 feet.

There are two bays on the east side, between 8 and 14 miles from the south point of the island, each being nearly 3 miles across; Darch isle fronts the southern bay, which has a sunken rock in the middle of it. The northern bay has the greatest depth, from 4 to 7 fathoms; a rock which dries 3 feet lies on the southern side of the entrance.

Britomart shoal.—Some sunken rocks, on which H.M.S. *Britomart* struck in 1838, lie N.W. 4 miles from cape Croker; as this neighbourhood has not been closely sounded, it should be given a wide berth.

COAST.—**Raffles bay**, about 6 miles to the south-westward of Croker island, is an inlet penetrating 5 miles into that portion of the mainland named Coburg peninsula; and is 2 miles broad at the entrance, between D'Urville point and High point. Both points and the western shore being fronted by rocks, the entrance of Raffles bay with depths of 3 to 4 fathoms is contracted to little more than one mile in breadth. The bay affords safe anchorage for vessels of suitable draught, sheltered from all winds. The British Government established a settlement (fort Wellington) on the eastern side of Raffles bay in 1827, which was abandoned in 1829.

The shores of Raffles bay are low and thickly covered with mangroves, but at the head is a cliff where Captain King saw two streams of fresh water, which, however, appeared as if they were only temporary.

Campbell reef, three-quarters of a mile in length, is 2 miles to the northward of D'Urville point, and 2 miles off the shore between that point and Danger point. The reef is in the way of vessels working along the western shore, if bound to Raffles bay or into Bowen strait.

Danger point.—**Port Bremer.**—From the entrance of Raffles bay the coast trends N.N.W. 5 miles to Danger point, a low point on the east side of port Bremer. A small sandy islet, No. 2, with a reef extending half a mile from its north end, lies 2 miles to the north-westward of the point, with charted depths of 4 to 5 fathoms between. Sandy islet, No. 1, lies 5 miles westward of islet No 2, with the entrance of port Bremer between. This islet is connected with the coast by a ledge of rocks. A patch of 6 fathoms is charted about 3 miles N. by E. of Sandy islet No. 1; it should be given a wide berth.

The shores of the bay are bordered with rocks and shoals, extending nearly 2 miles from the land.

Port Bremer, within Stewart point, is similar in extent and capabilities to Raffles bay, affording good anchorage, in a depth of from 4 to 6 fathoms, sheltered from all but north winds.

PORT ESSINGTON is an inlet 19 miles in length in a S.S.E. direction, with an entrance 7 miles wide between Smith point and Vashon head, and is available for all vessels. The land being very low on either side, port Essington is somewhat difficult to make; Orontes reef and other dangers lie in the approach. See aspect, p. 533, and view on plan.

The settlement of Victoria was established in 1838, and occupied until 1849 by a detachment of Royal Marines. Port Essington was probably

See chart, No. 1,042 [2,984]. and plan of port Essington, No. 1,333 [2,986].
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abandoned in some measure in consequence of the unhealthy nature of the climate and unproductive character of the country.

The depths throughout port Essington are generally very regular, varying between Orontes reef in the approach, and Record point, from 15 to 5 fathoms; when within Record point the depth gradually decreases to 3 fathoms abreast of the late settlement.

There is a bar about 2 miles wide, with a low water depth of about 5 fathoms, at about 8 miles within the entrance.

Smith point, east side of entrance to port Essington, is low, and rocky; the round tower on its extremity, built to distinguish this from the other low points projecting from the north side of the Coburg peninsula, is now in ruins, and cannot be distinguished by a vessel until she is inside the point.

A reef extends N.N.W. three-quarters of a mile from Smith point, some of the rocks on its outer extreme being above water.

Anchorage.—During the south-east monsoon good anchorage may be obtained between Smith and Black points, east side of entrance to port Essington. See Inner harbour, page 533.

Water.—The natives will point out where fresh water may be found in the vicinity of this anchorage.

Vashon head is a low, wooded point, having a rocky spit and foul ground with sunken rocks, extending 3 miles to the north-eastward. Within the head the land is low, swampy, and partly covered with mangroves, and a few casuarina trees, about 30 feet high. Two miles within the point there is a hill 157 feet in height. The coast westward of the point turns sharp to the southward into Trepan bay, and is fringed by a reef half a mile to one mile wide.

Off-lying reefs.—**Orontes reef**, on which a merchant vessel of that name was wrecked in December 1838, lies on the east side of the approach to port Essington from the westward. It is about one mile in length south-east and north-west, and three-quarters of a mile in breadth; from the north-west extreme, the shallowest part, which has only 2 feet water on it, Smith point bears S.E. $\frac{1}{2}$ S. distant $5\frac{1}{2}$ miles. As the sea seldom breaks on this reef, it cannot be seen even when close to it, though the water is usually discoloured.

Reported reef.—A reef, with 2 fathoms over it at low water, was reported by the *Ormeo*, in 1877, as lying in lat. $11^{\circ} 0' S.$, long. $132^{\circ} 3\frac{1}{2}' E.$ From this position Orontes reef is in line with Smith point bearing S.E. $\frac{1}{2}$ S., distant 10 miles.

This reef was unsuccessfully searched for by H.M. Surveying vessel *Flying Fish* in 1886; the natives of the locality knew nothing of it, though well acquainted with Orontes reef.

See plan of port Essington, No. 1,333 [2,986].

The Eastern shore of port Essington.—From Smith point, the general direction of the east shore is south-south-eastward $7\frac{1}{2}$ miles to Table head, which is low and rocky with a small sunken patch at a quarter of a mile to the north-westward of it. The most projecting part of the intermediate shore is Black point, close within which is a fresh-water pool. Reef point, which has a reef extending half a mile to the south-westward is the next projection, between which and Table head is Berkeley bay. The shore is varied by several small ranges of cliffs from 20 to 30 feet high, generally of a red or white colour; between these are shallow coves, backed by mangrove swamps; the low country being generally wooded by low dark looking gum trees. There is a red and white stratified cliff in the northern part of Berkeley bay, and in the bight at $1\frac{1}{2}$ miles to the north-eastward of Table head, is a red cliff, forming the north-east side of the entrance of Caiman creek.

Record point, 5 miles southward of Table head, is a low narrow tongue of sand, partially wooded, and extending 2 miles south-west from the general coast line; it is steep-to, there being a depth of from 6 to 8 fathoms at the distance of a cable.

A 2-fathoms shoal, with deep water round it, lies in the fair way of the Inner harbour; about N.N.W. $\frac{1}{2}$ W. rather more than half a mile from Record point.

The intermediate shore forms two shoal bays, divided by Observation cliff, at three-quarters of a mile to the north-westward of which lies a shallow patch.

The Western shore of port Essington from Vashon head trends south-eastward to Coral bay, which affords anchorage in from 3 to 4 fathoms, sheltered from easterly winds by Walford point, a narrow projection $1\frac{1}{2}$ miles in length, lying $4\frac{1}{2}$ miles south-east from Vashon head. The intermediate shore is fronted by reefs, and shallow water extends from half a mile to $1\frac{1}{2}$ miles from the land. A reef projects north-west half a mile from Walford point, and a small 6-foot patch surrounded by deep water lies somewhere about a mile to the eastward of the point, but its position is doubtful.

Turtle point, 3 miles within Walford point, projects nearly $1\frac{1}{2}$ miles from the general coast line, its extreme being fronted by rocks nearly a mile in extent south-east and north-west. On the west side of Turtle point is Kennedy bay, which is separated from a smaller bay to the north-west by Low point. From Turtle point the shore trends nearly south $3\frac{1}{2}$ miles to Curlew bay, a shallow cove on the west side of Curlew point. The shore is fronted by reefs extending from about half a mile to one mile from the land.

Knocker bay is an inlet between Curlew and Oyster points; the latter is a bluff head, with a 2-fathoms patch lying one mile to the north-eastward of it. Knocker bay penetrates about $3\frac{1}{2}$ miles to the southward, and with the exception of Bedford head, on the west side of the bay, the shores are generally low and covered with mangroves; the southern part is divided into two bights, with creeks penetrating into the mangrove swamps to the southward. The greater portion of the bay is encumbered by reefs and shoals bordering the shores, the depth between them being from 3 to 4 fathoms, mud.

Spear point, 2 miles S.E. by S. from Oyster point, is a rocky head, forming the west side of the entrance of the Inner harbour of port Essington. The intermediate shore is fronted by shoals, extending two-thirds of a mile from the land. Although the channel between Spear and Record points which leads into the Inner harbour, is nearly one mile wide, only the eastern side, by Record point, is navigable, as a reef extends two-thirds of the way across the channel from the western side. This contraction of the passage causes a great velocity in the tidal stream and a consequent increase in the depth of water, there being from 8 to 12 fathoms on the eastern side of the channel.

THE INNER HARBOUR of port Essington is a spacious and nearly land-locked sheet of water, divided into three bays by Middle head and Mangrove point. Middle head is a broad cliffy projection rising to a hill 200 feet high, and is fronted by rocks and shoals, with a spit having 6 feet water on its extreme, extending $1\frac{1}{2}$ miles to the north-westward.

Barrow bay on the eastern side of the Inner harbour, between Record point and Middle head, is about 3 miles in extent; its shore is generally low and covered with mangroves; the country behind this is more elevated and thickly wooded, Saddle hill being 250 feet high. There is a small creek nearly 3 miles to the eastward of Record point, apparently communicating with fresh water. The bay is skirted with mud flats, and is shallow throughout, the depth gradually increasing from one fathom near the shore to 5 and 6 fathoms in the entrance.

The shores of East and West bays, the shallow inlets at the head of port Essington, are fronted by mud flats and bordered with mangroves, intersected in the bights by creeks communicating through mangrove swamps with brackish and, in some places, fresh water. From Mangrove point, which separates these two bays, a spit extends three-quarters of a mile to the northward.

The site of the late settlement of Victoria is a table-topped projection of the western shore of the Inner harbour, extending about half a mile north and south between Minto and Adam heads; the latter, on which was formerly a block-house, is a whitish cliff about 45 feet high. There

is a small bight on the north side of Minto head, between which and Spear point the shore is fronted by shoals, extending out to a line joining Minto head and Record point. Between Adam head and West bay is Wanjewanja cove, which is nearly occupied by mud-flats.

Position.—The site of the late Government house, which is situated north-west, about a quarter of a mile from Adam head, was considered to be in lat. $11^{\circ} 22' 2''$ S., long. $132^{\circ} 9' 15''$ E., approximate.

Anchorage.—For large vessels the best anchorage in the Inner harbour is in a depth of 6 fathoms, at about three-quarters of a mile to the southward of Record point. Vessels of less draught may anchor in 3 fathoms, at a third of a mile off the late settlement, where fresh water may probably be procured at the wells formerly dug there.

The anchorage within Smith point, east side of entrance, is referred to on page 530.

Directions.—In making port Essington, little more need be said than to warn the navigator of the dangers lying to the eastward and northward of cape Croker, and to remind him that, the land being low, he must depend solely upon his reckoning for making the entrance of the port. Having made out Smith point, a vessel may enter the port between that point and Orontes reef, and proceed up in about mid-channel. In entering the Inner harbour, avoid the 2-fathoms shoal north-eastward of Oyster point, and a similar patch N.N.W. $\frac{1}{2}$ W. of Record point; pass within a quarter of a mile of that point, to avoid the shoal extending from Spear point, and, keeping clear of the spit projecting from Middle head, anchor as most convenient.

Currents.—Off Vashon head, the west entrance point of port Essington, the current sets to the westward between the months of March and October, increasing in strength towards Danger point, the west entrance point of Bowen strait; the direction of the current changes with the monsoon, the average rate being one knot an hour.

Tides.—It is high water, full and change, in the Inner harbour of port Essington, at 3h. 24m.; springs rise 13 feet; the rise and fall are irregular, and the range sometimes does not exceed 3 feet. The stream of rising tide sets strongly to the westward past Smith point and Vashon head.

Aspect.—The country about port Essington is generally low and thickly wooded, the most elevated hill not exceeding 250 feet. Much of the land is swampy and covered with mangroves, with several creeks and lagoons containing fresh or brackish water, according to the season of the year.

The cliffs and rocks are of a varied kind of red and whitish sandstone, in some places rather soft and powdery, and in others more hard and tough, with various quantities of ironstone in its composition. The

masses of ironstone in the cliffs generally form small points, the sandstone having been worn away on either side. The surface of the ground, except in the swamps and lowest hollows, is composed wholly of sand and gravel of the same nature as the rock, with small ironstone pebbles, without any apparent mixture of vegetable soil.

Vegetation naturally partakes of the character of the soil, the forest or bush, consisting of small gum and other trees, and some straggling grass; but little or no other undergrowth of any kind is to be seen over large tracts. In some parts the cabbage-palm is plentiful, and near the lagoons there is coarse rank grass.

COAST.—Trepang bay, immediately to the westward of Vashon head, is nearly 8 miles across from Vashon head to Araru, a low sandy point, covered with mangroves and pandanus. A small sandy islet named Allaru lies $1\frac{1}{2}$ miles to the north-west of this point, and is surrounded by a reef that extends half a mile to the northward of it.

Trepang bay is 4 miles in depth, and near the head is divided by a reef that stretches out nearly 2 miles from some conspicuous red cliffs. There is good anchorage everywhere in the bay, which shoals gradually to the head, but the coast all round has a fringing reef extending generally half a mile from the shore. There are a few huts on each side, occasionally inhabited by natives collecting trepang.

H.M.S. *Flying Fish* anchored in a depth of $5\frac{1}{2}$ fathoms, with Red cliff at the end of the bay bearing S. 30° E., and Araru point S. 86° W.; good holding ground of blue mud.

The tidal stream is scarcely felt in Trepang bay.

Blue-mud bay, the indentation next westward of Trepang bay, is $3\frac{1}{4}$ miles wide between Araru and Lingi points, and 3 miles in depth; but, with the exception of two narrow arms, it is nearly filled up by reefs. The bay, however, affords secure anchorage for boats and small craft, and is the headquarters of the trepang fishery. Lingi, the western point of the bay, is well wooded, the trees being about 60 feet high; the point ends in a narrow sand spit half a mile long, and it is surrounded by a reef that dries for one mile off at springs, and past which the tide sweeps at the rate of 2 to $2\frac{1}{2}$ knots.

POPHAM BAY, the most western indentation of Coburg peninsula, is 6 miles wide from Lingi point to cape Don, and is divided into two bays by Observation point, close off which is a bank of sand and dead coral. Bird island, a low flat islet covered with grass, lies three-quarters of a mile N.N.E. of the point. This islet was the observation spot of the *Beagle* in 1839, and of the *Flying Fish* in 1886. Over Observation point rises Popham hill, very steep on its northern side, and conspicuous.

The Eastern bight of Popham bay is the larger of the two; it extends nearly 3 miles inland, shoaling gradually to the head, where it merges into a mangrove swamp, which reaches across to Van Diemen gulf. In this swamp are several creeks, one of which runs right through the western projection of Coburg peninsula, with just sufficient water to allow a whale boat to be got through at high-water, neaps. This creek is used by the natives for their canoes, in order to avoid rounding cape Don, where there is often a dangerous tide race.

Anchorage.—There is very good anchorage in the south-east monsoon in a depth of 9 fathoms, with Lingi point bearing N. 25° E., and Popham hill South; care must be taken to avoid the reef extending from Lingi point, as there are detached patches at some distance off it.

The Western bight of Popham bay is small, and the depths in it are irregular. Immediately to the southward of Observation point there is a little cove, with a depth of 4 to 6 fathoms, and a white sand beach at the end; it is much narrowed by reefs on either side. This cove, and a small lagoon further west, are visited by natives from Blue-mud bay on their fishing expeditions.

The ground is very foul for 1½ miles northward of cape Don; and at that distance from the cape there is a shoal with less than one fathom; nearer the shore there are groups of rocks, some of which are above water. This vicinity should be avoided, as the tides are very strong.

Position.—Bird island, off Observation spot, in Popham bay, lies in lat. 11° 16' 13" S., long. 131° 47' 36" E. (*Flying Fish*, 1886.)

Tides.—It is high water, full and change, at Bird island, Popham bay, at 5h. 42m.; springs rise 8 feet. Within the bay the streams are not very strong, but in the offing they run at the rate of from 2½ to 3 knots.

Cape Don, the south-west point of Popham bay, the east point of entrance to Dundas strait, and the western extreme of Coburg peninsula, is a low wooded point fronted by reef. The land rises to a rounded hill 130 feet high at one mile to the south-south-eastward of the cape.

DUNDAS STRAIT, the entrance into Van Diemen gulf from the northward, is 14 miles across from cape Don to the east extreme of Melville island.

Neither the strait nor the gulf have been surveyed, and many dangers no doubt exist that are not shown on the chart; the positions of others are doubtful, requiring considerable care as regards speed and the use of the lead. Many are so steep to that the lead will give no warning, as in most coral waters.

The water is generally deep, but the soundings are irregular, and the bottom mostly rocky. Much discoloured water is met with.

Tidal streams.—The set and turn of the streams in Dundas strait are approximately as follows:—during springs they run with considerable strength, and cause strong tide rips.

Off cape Don, at springs, they raise a dangerous race; the *Flying Fish* could hardly stem the flood tide at springs when steaming 5 knots. (This rate is possibly exceptional.)

The stream of rising tide enters Dundas strait from the northward, and sets south-east past cape Don. The stream of falling tide sets to the northward out of the strait. See times of high water, pp. 535 and 541.

The streams of rising tide, from the northward through Dundas strait, and from the westward through Clarence strait, meet somewhere about 30 miles E.N.E. of cape Hotham in Van Diemen gulf. The uncertainty, however, of this position renders navigation of this part of the strait somewhat difficult. Captain Stokes, when at anchor at a position 2 miles north-east of cape Hotham, noted that the streams set W. by S. and E.N.E., at the rate of from half a knot to 2 knots; the westerly stream beginning nearly 3 hours after high water.

VAN DIEMEN GULF is bounded to the northward by Coburg peninsula; to the eastward and southward by the mainland, and to the westward by Melville island. The gulf extends 75 miles east and west, and is 45 miles in breadth. There are two entrances, Dundas strait, already described, to the northward, and Clarence strait to the westward, between Melville island and the mainland.

Depths.—Dangers.—The few soundings taken in the surveying vessel *Beatrice* in 1864, across Van Diemen gulf, show the bottom to be irregular, the depths varying from 20 to 5 fathoms, sand, with coral patches of less depth in places. The greater portion of the gulf has not yet been examined. The principal charted dangers are as follows:—

Patches of 3 to 5 fathoms lie off the bay northward of cape Keith, east coast of Melville island. The outermost, as charted, has a depth of 4 fathoms and lies with the cape bearing W.S.W. distant $5\frac{1}{2}$ miles; it possibly extends further seaward. H.M.S. *Barracouta* passed over this.

Renard shoal, with $8\frac{1}{2}$ feet water over a sandy bottom, lies with the north end of cape Keith bearing N. 42° W., distant about 4 miles; it is about $1\frac{1}{2}$ cables in diameter, with a depth, close to its east side of 14 fathoms.

Between Renard shoal and cape Keith the general depth is 7 to 9 fathoms, but a small 5-fathoms patch lies W. by S. $2\frac{1}{4}$ miles from the shoal with the outer extreme of the cape bearing N. $\frac{3}{4}$ W.

Claude Hamilton reef.—Captain Sinclair, of the *Claude Hamilton*, reported a reef to lie with the north-east extreme of cape Keith bearing N. by E., distant about 8 miles, and a peaked hill on

See charts, Nos. 613 [2,987] and 1,095 [2,988].

Melville island W. $\frac{3}{4}$ N. The depth of water on the reef is not stated; close to, on the eastern edge, it was 7 fathoms, deepening quickly to 12 and 17 fathoms.

Taiyuan shoal.—The steamship *Taiyuan*, in 1888, struck on a shoal of small extent, composed of grey sand and broken shell, having a least depth of 17 feet, with $3\frac{1}{2}$ to $5\frac{1}{2}$ fathoms close around, and 10 fathoms at a short distance. It was reported to be situated with cape Keith bearing N. $\frac{1}{2}$ W., distant $14\frac{1}{2}$ miles. The exact part of the slope of the hills at the back of cape Keith, which would, at a distance of 14 miles, appear as the extremity, being unknown, the position given is very doubtful, and probably the shoal lies further to the westward.* This danger is probably identical with the shoal reported by Mr. Winter, in 1892, about 3 miles north-west of *Taiyuan's* position, with the hill over cape Keith bearing N. $\frac{1}{2}$ W., distant 15 miles.

Beagle reef.—H.M.S. *Beagle*, in July 1842, discovered a reef N. $\frac{1}{4}$ E., distant 13 miles from cape Hotham. It is $2\frac{1}{2}$ miles in length, east and west, and dries in places at low water springs. For dangers to the westward, see Rooper rock, &c., page 546.

Beatrice reef, 3 miles in extent north-west and south-east, lies in the eastern part of the gulf, S.S.E. $\frac{1}{2}$ E., 15 miles from the south-west point of Greenhill island; it dries at low water near its centre. There is also a 2-fathoms patch at S.S.W., 10 miles from the same point; other shoal patches of from $2\frac{1}{2}$ to 4 fathoms lie north-eastward of Beatrice reef.

Victoria shoal, (reported in 1886), of coarse grey sand and about $1\frac{1}{2}$ miles in extent, with 5 to 6 feet of water on it, lies about 9 miles south-west of Beatrice reef, with mount Roe on Coburg peninsula bearing N. $\frac{1}{4}$ W.

North shore of Van Diemen gulf.—The coast of Van Diemen gulf has not been surveyed, and only the prominent points have been sketched in; this fact should be remembered in using the charts. From cape Don the coast trends easterly for about 4 miles, and then south-eastward for some 20 miles as far as the south point of Coburg peninsula; midway in this distance there is a projecting point with a high black rock off it.

Mounts Bedwell and Roe are two conical hills rising respectively 5 and 3 miles north-westward of the southern point of Coburg peninsula; the first named is 426 feet high, and mount Roe 482 feet.

* A search was made in 1888 by H.M.S. *Myrmidon* over the locality reported by the *Taiyuan* without the discovery of any danger. As the bottom, however, is uneven, and the position of the *Taiyuan* was very doubtful, the shoal is retained on the Admiralty charts (P.D.) until a complete survey can be made.

See charts, Nos. 613 [2,987] and 1,042 [2,984].

Aiton bay, to the northward of mount Bedwell, is mostly dry at low water; it extends to the south-eastward as a long inlet. Burford island low and covered by mangroves, lies off the bay, 5 miles to the westward of mount Bedwell.

From a small bay on the east side of mount Roe, the coast trends eastward 23 miles to the isthmus between Van Diemen gulf and Mount-norris bay, and is fronted by Sir George Hope islands.

Sir George Hope islands are seven in number, lying from one to 8 miles off the shore. Greenhill island, the westernmost and largest of the group, extends from one to 6 miles from the foot of mount Roe. A conspicuous cliff forms the north-west part of the island, and its south-west point is encompassed by a reef. The passage between Greenhill island and the foot of mount Roe is very narrow, on account of the reefs on either side; but there is a depth of 15 to 18 fathoms in the middle of this channel, which leads to a port or roadstead formed between the islands and the coast, where anchorage can be had in from 5 to 15 fathoms. Three small islets, with reefs, lie close to the northward and eastward of Greenhill island, and the remaining islands of the group lie near each other, from 10 to 14 miles farther to the eastward. May Day island, the largest and south-westernmost of these islands, has shallow water extending off its western side from 3 to 4 miles, and possibly connecting it with the islands westward. There is also shallow water between May Day island and the western point of Endyalgout island on the eastern side of the gulf.

The East shore of Van Diemen gulf is very low, and broken by points and islets, and difficult to approach on account of shallow water; it has not been closely examined; but this shore, including Endyalgout island, appears to take a southerly direction from the isthmus for about 33 miles to the East Alligator river, in the south-east bight of the gulf.

East Alligator river is about 4 miles wide at the entrance, from whence it was traced 14 miles, following the windings of the stream, in a south-east direction. A shoal which dries extends one mile from the western entrance point, and the mouth of the river is apparently much encumbered with mud flats. The depths vary from $1\frac{1}{2}$ fathoms in the entrance to half a fathom at 8 miles within, whence it increases to 3 and 4 fathoms for the next 6 or 7 miles. The low banks on either side are formed of soft mud, and are so thickly covered with mangroves as to make landing impracticable, until 7 or 8 miles up the river.

At Captain King's farthest examination of this river the banks were 200 yards apart, with two hills nearly 3 miles to the eastward; one of these is of a sugar-loaf shape, and visible from the mouth of the river. At about 15 miles to the south-eastward is a small range with two peaks,

visible at the distance of 20 miles ; with these exceptions the country is uniformly flat, in some parts covered with grass.

Birds of various kinds were abundant and alligators numerous and large.

Natives.—No natives were seen, but fires in all directions proved the country to be inhabited.

TIDES.—It is high water on the bar of East Alligator river, full and change, at 8h. 15m. ; rise 15 feet.

Field and Barron isles.—Field isle, which lies off the entrance of the South Alligator river, 10 miles to the westward of the East river, is low, thickly wooded, and 10 miles in circumference ; it is surrounded by a reef, dry at low water, and extending nearly 2 miles to the north-westward. Barron islet, 2 miles to the southward of Field isle, is also low and surrounded by a reef, apparently extending to the west point of the entrance of South Alligator river. There is a narrow boat channel with over-falls in it between the two islands.

South Alligator river has a clear approach through Cunningham channel from the east side of Field isle, the depth of water being from 9 to 6 fathoms. The north-eastern side of the entrance of the river is low, but the opposite shore is formed by the base of mount Hooper, a small wooded range with three peaks. The entrance is 4 miles wide, apparently free from any bar, and the river is navigable for at least 17 miles above the entrance, at which distance Captain King found 6 fathoms water ; the least depth was 4 fathoms, at about 4 miles within the entrance.

South Alligator river was explored for 36 miles, following the windings of the stream, in a southerly direction, to within about 4 miles of a peaked hill ; at this position the river was 150 yards wide, the depth at high water being $2\frac{1}{2}$ fathoms. The hill from its height would be visible from a distance of about 27 miles.

The banks of South Alligator river were in most parts thickly lined with mangroves, and nowhere more than 3 feet above high water. They were formed of soft mud, which rendered landing impracticable except at high water. The country on all sides is a low plain, without any other object to break its level appearance than a few wooded hills and some groups of trees, amongst which the palm tree was conspicuous. The low land, at least where the fire had not passed, was covered with a thickly matted broom grass ; the soil observed being a hard stiff clay, which appeared to have been frequently inundated either by high tides, or more probably by freshes in the rainy season.

The water at 36 miles up the South Alligator river was slightly brackish but would probably be quite fresh at half ebb. The few birds seen were

chiefly cockatoos. Alligators were numerous, from which circumstances these rivers receive their names.

West Alligator river, 6 miles to the westward of the river just described, is an opening between mount Hooper and a point of the mainland at 6 miles to the westward of Barron islet. There are some wooded ranges on the point, and a reef lies 2 miles to the north-eastward of it. The west river was not examined, but, as it bore a similar appearance to those described to the eastward, this was named West Alligator river.

The South shore of Van Diemen gulf from the north-west entrance point of West Alligator river trends westward 55 miles to cape Hotham, forming two bays of nearly equal extent (Finke and Chambers bays), divided by the low broad point Stuart,—this being the point struck by the famous explorer of that name in 1862. The coast and country behind it are very low, and apparently thickly wooded. About 10 miles eastward of the point is the mouth of the river Wildman. This shore has not been sounded.

CAPE HOTHAM is a low, wooded promontory with a sandy beach fronted by isolated coral reefs, to the distance of 2 miles northward, and $6\frac{1}{2}$ miles to the eastward. On the western side, cape Hotham, and the coast southward to Adelaide river, is skirted by a reef, which dries at low-water springs, from a quarter of a mile to three-quarters of a mile off, with irregular depths under 5 fathoms to the distance of 2 miles in places.

Howard knoll, with a least depth of $2\frac{1}{2}$ fathoms, coral, is the outer danger off cape Hotham, and lies with that cape bearing S. $\frac{1}{4}$ W. distant $2\frac{1}{10}$ miles. A patch of $2\frac{1}{2}$ fathoms is charted N.E. by E. $\frac{1}{2}$ E. distant $9\frac{1}{2}$ miles from the cape.

Escape cliff, 6 miles from cape Hotham, is composed of reddish earth, and is 28 feet high with a level top; the first cliffs of a red colour, seen on the eastern shore of Adam bay, are at about 3 miles from cape Hotham.

Northward of Escape cliff, mangroves extend to the north-east for one mile, to a clear sandy beach a quarter of a mile in extent. Southward of Escape cliff the land sweeps round in a sandy bay with mangroves towards the mouth of Adelaide river, forming the east shore of Adam bay. The west shore of this bay, southward of Stephens (Charles) point, is entirely fronted by thick mangroves, and a mud bank extending off in some places for the distance of one mile.

Stephens (Charles) point, the counterpart of Escape cliff but only 14 feet high, is wooded, and fronted by a reef extending nearly half a mile off, on which are two or three rocks only covered at about high water.

See charts, Nos. 1,042 [2,984] and 1,095 [2,988].

Rocky patches, extending 2 miles off shore between N.N.E. and N.E. from Stephens point, are distinguished by tide rips setting over the shallower parts, causing ripples. Some of the rocks are nearly awash at low water springs.

Stephens bank is a tongue of shoal water which stretches N. by E. $\frac{1}{2}$ E. from Stephens point for nearly 3 miles, and thence N.E. for $2\frac{1}{4}$ miles. On this bank there are large patches of 2 to 3 fathoms, the general depth over the remainder of the bank being 4 to $4\frac{1}{2}$ fathoms.

ADAM BAY AND ADELAIDE RIVER.—Adam bay, the estuary of Adelaide river, is 6 miles wide between Escape cliff and Stephens point, with depths less than 3 fathoms within the line joining them. Stephens bank and other dangers extend 5 miles north-north-eastward of Stephens point, west side of the approach.

Bar.—The bay is encumbered with sand and mud flats with less than 6 feet over them, forming a bar, through which the water from Adelaide river has forced a channel about a quarter of a mile wide; this passage has a depth of about 2 fathoms in the fairway abreast Stephens point, deepening to 3 to 6 fathoms abreast Middle bank, whence it shoals towards port Daly in the entrance.

Tides.—It is high water, full and change, at Stephens point at 5h. 30m. Springs rise 17 feet, neaps $12\frac{1}{2}$ feet; neaps range 8 feet. The velocity of the stream is from 2 to 3 knots. In the Narrows, the entrance to Adelaide river, it runs from 5 to 6 knots; at Castle point, about 12 miles up, at the rate of $2\frac{1}{2}$ knots.

Directions.—The land is too low to afford any good leading marks, and the water is at times too muddy to admit of the shoals being seen, so that very great caution is necessary in attempting to enter, as the channel is not buoyed. A sailing vessel should enter the channel at the last quarter flood, which will take her to an anchorage in port Daly at the entrance of the river, where the only inconvenience will arise from a 3-knot tidal stream. From thence she may proceed up as most convenient. The prevailing sea and land breezes make the bay easy of access, either from the eastward, through Dundas strait, or the westward, through Clarence strait.

The following directions, which applied when the survey was made, may afford some guide :—

Bring Stephens point to bear S.W. $\frac{1}{2}$ W., and steer towards it on that bearing, until Ayers point bears S.E. $\frac{1}{2}$ S., when steer towards it, until Glyde point is nearly shut in with the mangroves of Stephens point bearing W. by N. $\frac{1}{4}$ N.; when alter course to S. by E. $\frac{1}{4}$ E. for the inner end of the tall straight mangroves forming Hart point. When the tuft of high

See plan of Adam bay and Adelaide river, No. 1,704 [2,989].

trees at Ayers point bears E. $\frac{1}{2}$ S. steer E. by S. passing about 2 cables south of Ayers point, and proceed up the river or anchor in 4 fathoms in port Daly as convenient.

Due allowance must be made for the tidal stream, especially when steering S. by E. $\frac{1}{2}$ E. as it sets obliquely across that course. Both streams continue to run for about $1\frac{1}{2}$ hours after high and low water.

Ayers point, the east point of entrance to Adelaide river proper, is a low muddy point with mangroves to the northward, and two or three clumps of tall mangroves to the south-eastward, the land behind being covered at high-water springs. The point can be approached to 100 yards in $3\frac{1}{2}$ or 4 fathoms water on any bearing northward of E.N.E.

Hart point, the west point of the river entrance, lies nearly one mile S.S.W. from Ayres point, with tall straight mangroves for half a mile to the north-west of it. The shore shelves off from Hart point towards Ayers point for about 2 cables, with 9 and 10 feet water on it.

Port Daly is the name given to the space included between Ayers and Hart points on the west, and Andrews point to the east. In this space, which is $1\frac{1}{4}$ miles in length and one-third of a mile in breadth, the depths vary from 15 to 29 feet. Andrews point is low and green, with thick straight mangroves on it. The best temporary anchorage for a vessel is, with Ayers point bearing about N.W. at a little more than one cable from the north shore, in 28 feet water, sand and stones.

ADELAIDE RIVER, within port Daly, its entrance, is divided into two branches, the main stream trending to the southward, and the Salt-water arm to the south-westward. The former was traced by Captain Wickham, in 1839, for 80 miles, following the windings of the stream; but in a direct line S. $\frac{1}{2}$ E., about 43 miles; the river varying from 80 to 250 yards in breadth, with a depth of 5 fathoms water. The surveying vessel *Beatrice*, in 1864, with a draught of 12 feet, ascended 53 miles, where the river was 60 yards wide. Commander Hutchinson, in his boat, proceeded 6 miles beyond, with depths of $1\frac{1}{2}$ to 6 fathoms; here the river was 30 yards wide. The water was fresh, but the influence of the tide was still felt.

Aspect.—Between 20 and 70 miles from the mouth of Adelaide river the soil is good light-coloured mould, apparently well calculated for the growth of sugar-cane, rice, coffee, and spices. Above this, commencing at a coarse, red, gritty sandstone projection, the aspect of the country changes from that of low plains to a slightly wooded and gently undulating surface, in some places stony. This aspect continued to the farthest point reached, where the river became very narrow, and divided into two branches, one taking a southerly, and the other an easterly direction.

See plan, No. 1,704 [2,989].

The former was blocked up by fallen trees, and the latter was too narrow for a boat's oars to work.

Adelaide river swarmed with alligators, fish were plentiful, and many of the reaches abounded with wild fowl consisting almost wholly of whistling ducks. Few natives were seen, and those were timid.

The following description of Adelaide river is taken from the remark book of H.M. surveying schooner *Beatrice*, Commander J. Hutchinson, R.N., 1864. Rounding Ayers point the river at once takes a turn to the eastward for nearly a mile, forming the inner portion of port Daly, and then runs south-east, having a width of 3 cables for two-thirds of a mile to the Narrows, where the cliffs which are low and of the same character as Escape cliff, contract the width of the river to between $1\frac{1}{2}$ and $2\frac{1}{4}$ cables for a third of a mile in length, when it widens again to upwards of half a mile. For 13 miles above the Narrows as far as Castle point, several large creeks run into the east side of the river, the country at the back of the mangrove banks is swampy, the land being nearly about the level of high-water mark. At about 3 miles above Castle point, the river takes a sudden turn to the north-east round a point with a magnificent clump of mangrove trees on it, beyond which the trees are cleared away and there is brought to view large grassy plains stretching away to the eastward as far as the eye can see. The river now becomes winding and the reaches very similar to each other, the width being about 300 yards; the convex sides are covered with mangroves, while the concave sides are open and show the country beyond. Numerous small creeks, which can be traced a long distance, flow into either side. The river narrows to 150 yards, and at 32 miles from its mouth the water is brackish. At about 50 miles up the river becomes forked, one branch going south-east and the other south-west, the former not more than 30 yards, and the latter 60 yards wide.

At high water the banks were just level with the river; but some low grassy ranges were in sight to the eastward and south-eastward; also a bare range about 80 feet in height, and a mile in extent W.N.W. and E.S.E., to the northward; the land to the westward gradually rising to a height of 500 feet, and lightly timbered. At 53 miles up the river, the highest point reached by the *Beatrice*, the river was 60 yards wide. Commander Hutchinson proceeded for 6 miles farther in a boat, where the river was about 30 yards wide, as before stated; here the water was fresh but muddy, and a low grassy range of hills lay close to the east bank; to the south-westward the land was higher, forming a flat-topped range with deep ravines. He considered the river quite navigable for short vessels of 200 or 300 tons for a distance of 50 miles.

The Salt-water arm of Adelaide river, immediately south of Hart point, is two cables wide, with low banks fringed with tall mangroves; it first takes a south-west direction for one mile from the entrance, with a

depth of 20 feet, the next reach trending to the southward for 2 miles; it then divides into two branches, one trending 6 miles to the south-eastward, and the other about the same distance to the south-westward, when each, after preserving a depth of 2 and 3 fathoms for some distance, terminates in what, at low water, is a mere ditch, overgrown with mangroves.

COAST.—Glyde point lies $2\frac{1}{2}$ miles westward from Stephens point, the coast between forming a bay about $1\frac{1}{2}$ miles deep, with low mangrove shores, and the back land showing up in the distance higher than any other part of the bay. In the south-west corner of this bay is Leader creek, with 12 feet water at its mouth, possessing the same character as the Salt-water arm.

Gunn point.—From Glyde point the low coast takes a westerly direction for 4 miles to Fright point, and then for $3\frac{1}{2}$ miles to Gunn point; after which it turns sharp southward to shoal bay. The coast is bordered by a reef which dries at low water and extends 2 miles north of Gunn point. Three clumps of mangroves form three islets at high water between Fright and Gunn points.

Shoal bay is a semi-circular bay southward of Clarence strait, between Gunn and Lee points. The bay is 11 miles broad, and the depth of water is 5 fathoms between the points, shoaling gradually to the shores. Hope inlet is a shallow creek at the head of Shoal bay, the eastern entrance point of which is marked by a clump of high casuarinas rising well above the low mangrove shore. On the western shore there is a sugar plantation.

The land at the back of Lee and Gunn points is about 100 feet in height, but around the head of the bay it is low and thickly wooded in places.

Foelsche bank is a narrow sandbank $2\frac{1}{2}$ miles in length N.N.E. and S.S.W., with from $1\frac{1}{2}$ to 3 fathoms water, and 5 to 6 fathoms close around, excepting to the south-westward, where a depth of $3\frac{1}{4}$ to 4 fathoms continues for about $2\frac{1}{2}$ miles. The northern end of the bank lies 2 miles N.W. $\frac{1}{4}$ W. from the western mangrove islet off Gunn point, and the southern end lies 2 miles W.S.W. from the same point. There is a channel with depths of 5 to 12 fathoms, between the bank and the reef off Gunn point.

Tides.—It is high water, full and change, in Shoal bay, at 6h.; springs rise 18 to 25 feet, neaps 10 to 15 feet. The flood stream sets from S. by E. to E. by S.; and the ebb from N.E. to W.S.W.

Coast.—From Lee point a low rocky projection, with a rocky ledge which dries 4 feet, extending nearly one mile off it, the flat coast trends south-west for 7 miles to East point, on the eastern side of the entrance of port Darwin.

CLARENCE STRAIT, the western entrance to Van Diemen gulf, is 13 miles wide between Fright point and cape Gambier, the south extremity of Melville island; but the strait is divided into three deep-water channels by the Vernon islands. Of these channels, the widest—the northern—is considerably narrowed by the reefs off Melville island, and by detached reefs in the passage. Cape Gambier is bordered by a reef which dries to a distance of considerably more than a mile; and shoal water and detached reefs reach to a distance of $3\frac{1}{2}$ miles from the cape. There is also a shoal on which H.M.S. *Beagle* obtained $3\frac{1}{4}$ fathoms with the cape bearing N. by E. distant 5 miles, which shoal has not been sounded out, but the bottom is very uneven to the westward of North-west Vernon island. Howard channel, the middle passage, p. 547, with a least width of one mile, is therefore recommended; two of its principal dangers are marked respectively by a buoy and a beacon, but they must not be depended on. South channel is less than half a mile in width.

Structure of reefs in Clarence strait.—The reefs surrounding the Vernon islands, as well as those off Fright point and cape Gambier, present a peculiarity of structure, a short description of which, from its importance as regards the navigation of this locality, will not be out of place here. The reefs, composed of coral and iron sand-stone, rise in terraces or raised levels, about 2 feet one above the other, each terrace or level being clearly defined by a horizontal ridge or lip of hard coralline substance which retains the water when the tide falls. The water within the pools thus formed, is about 2 feet deep, and the enclosed space is full of patches of rotten coral on a level with the surface of the water. As a result of this structure, a rise of a few feet causes a remarkably sudden alteration in the appearance of the reef; besides which change, the effect of refraction over the heated water in these shallow pools at low water causes the reefs themselves with islands, stones, birds, &c. upon them to appear larger than they are in reality, whilst objects behind the reefs are correspondingly obliterated.

THE VERNON ISLANDS are three wooded coral islands, the tops of the trees showing an almost uniform level about 40 feet above the sea; each island stands on a separate reef of coral and iron sandstone which is entirely covered at high water, but exposed at low water, the edges of the reefs which are steep-to, drying about 6 feet at springs. The islands have not been explored, but as eucalyptus trees can be seen above the fringing belt of mangroves it is evident that the centre of the island is dry land.

North-west Vernon.—The western extremity of this island, Ward point, is a raised bank of white sand with detached trees upon it. The reef dries out to one mile west of Ward point and then shelves

See chart, No. 1,095 [2,988].

gradually to 8 fathoms at one-third of a mile farther out. On the eastern side of the island the reef projects $3\frac{1}{2}$ miles east of the mangroves, and Knight reef, $3\frac{1}{4}$ miles in length and $1\frac{1}{4}$ miles in greatest breadth, lies E.N.E. of this island reef, separated from it by a channel 7 to 12 fathoms deep. As sand-banks have begun to appear on Knight reef it is probable that it will before long become an island.

East Vernon.—On the western side of this island the reef narrows to a spit, the extremity of which is 6 cables west of the mangroves. On the eastern side the reef dries to a quarter of a mile from the mangroves, and shoal water extends from the south-eastern point to $1\frac{1}{2}$ miles, at which distance E. by S. $\frac{1}{2}$ S. from that point there is a depth of $3\frac{1}{2}$ fathoms, generally indicated by tide ripples. On the north and south sides of the island the mangroves grow nearly to the edge of the reef.

Rooper rock, 3 miles east from the mangroves of East Vernon island, is composed of coral, and is about a quarter of a mile in length. The least water over it is 13 feet on a pinnacle rock at the south-west side of the shoal, from which the north-east extreme of East Vernon bears W. $\frac{2}{3}$ N., distant 3 miles. The general depth over the shoal is 5 to 6 fathoms, with 8 fathoms close around. When the tidal stream is strong there is a heavy race over the spot.

The dangers to the eastward have been described on pp. 536, 537.

South-west Vernon island.—On the west side of the island the reef dries to two-thirds of a mile from the trees. On the eastern side the reef is very wide, and extends to $1\frac{1}{2}$ miles from the trees. It is indented by creeks and has some sand cays on it, which cover at about half tide, and often shift their position.

Five-fathoms patch.—At 3 miles E. by N. $\frac{1}{2}$ N. from the east point of South-west Vernon, and $1\frac{1}{2}$ miles south of the middle of East Vernon, there is a patch with from 5 to 10 fathoms water. It is $1\frac{1}{4}$ miles in length, east and west, and one mile wide.

Henry Ellis reef lies $1\frac{1}{4}$ miles N.W. by W. of the north point of South-west Vernon, is 4 cables in length east and west, and very narrow. It uncovers at low water spring tides, and has a depth of about 5 fathoms water close around.

Beacon.—An iron tripod beacon surmounted by a diamond-shaped head, elevated 18 feet above high water, is erected on the north-western extremity of Henry Ellis reef.

Lyne reef, a small reef which uncovers at low water, lies W.N.W. distant $1\frac{1}{4}$ miles from the western point of South-west Vernon island; there is a depth of 10 fathoms close off its western end, and of 5 fathoms near its eastern side.

Marsh shoal is $1\frac{1}{2}$ miles in length east and west, and from a quarter to half a mile in width, with depths of $1\frac{1}{2}$ to 3 fathoms over it. The western end of the shoal is $4\frac{1}{2}$ miles S.W. by W. from the western extremity of the trees on North-west Vernon island, and is marked by a spherical buoy, with red and white horizontal stripes, surmounted with a black staff and globe. Irregular soundings of from $3\frac{1}{2}$ to 8 fathoms extend for nearly one mile southward and eastward of the east end of Marsh shoal, and there is a depth of $3\frac{1}{2}$ fathoms for 4 cables west of the shoal.

CHANNELS.—North channel, between cape Gambier and North-west Vernon island is, as already stated, more than half blocked on its northern side by reefs which are the more dangerous as they only show at low water; this channel, therefore, is not recommended. A detailed description of these reefs would be perplexing, and the mariner must be guided by the chart. The southernmost danger, Harris reef, has a depth of 8 fathoms close to its southern edge.

The southern part of this channel is $2\frac{1}{2}$ miles wide, but Oliver and Smith reefs, and Price knoll, lie in the middle of it, and there are no marks at high-water to clear either these or the fringe reef of North-west Vernon island; moreover, the ground to the westward of this channel has not yet been examined. Wood rock, with a depth of 4 fathoms over it, lies $2\frac{1}{2}$ miles W. by S., and a patch with $4\frac{1}{2}$ fathoms, lies 4 miles W. $\frac{1}{4}$ S. from the western extremity of North-west Vernon island, and there may be other patches undiscovered.

Howard channel, between East and South-west Vernon islands, is the clearest and best defined channel, and the only one used by ocean steamers; the depth in it is from 20 to 30 fathoms, and the reefs are steep-to.

South channel, between South-west Vernon island and Fright point, has no marks to clear the reefs when covered; and there are two awkward shoals at the eastern end of the channel for which there are no good clearing marks. The South channel is only used by small steamers proceeding to Adelaide river from port Darwin.

Tidal streams.—The streams at springs run with a velocity of 4 knots in the centre of the Howard channel: the stream of rising tide setting to the eastward, and that of falling tide to the westward. *See* tides, p. 541.

Directions.—Vessels bound to port Darwin from the north-eastward through Dundas and Clarence straits should steer a course to pass eastward of Renard reef and the reported position of Taiynan shoal, and thence north-westward of cape Hotham and Howard knoll for Howard channel. Due allowance must be made for the set of the stream, remembering that

See chart, No. 1,095 [2,988].

the flood stream enters Dundas strait from the north-eastward and after passing cape Don sets south-eastward towards the head of Van Diemen gulf, being joined eastward of cape Hotham by the stream through Clarence strait from the westward.

During the south-east monsoon the smoke from the bush fires, combined with the haze which invariably hangs over the low land, renders it very difficult to distinguish the land during the night. It is advisable, therefore, for a steam vessel at night to run her distance from cape Don, and then to anchor until daylight.

After sighting cape Hotham a course should be shaped to pass $2\frac{1}{2}$ miles eastward of the south-east point of East Vernon island in order to avoid Rooper rock, and when this danger is passed the course should be altered to pass through Howard channel.

When abreast of the south-east end of East Vernon island or soon afterwards, the beacon on the west end of Henry Ellis reef will be seen ; and when abreast of the beacon, which should be left on the port hand, the spherical staff and globe buoy on the west end of Marsh bank should be made out to the westward. A vessel may then either continue her course round the Marsh buoy, leaving it on the port hand, or from Henry Ellis reef she may steer to the south-west for port Darwin, passing on the east side of Marsh bank, being careful to avoid Lyne reef and the shoals off Gunn point. The hill (about 45 feet high) near the middle of East Vernon island kept open of the north-west extreme of South-west Vernon island bearing N.E. by E. $\frac{1}{2}$ E., leads north-westward of Foelsche bank and the Gunn point reefs ; see view on chart No 1,095.

MELVILLE ISLAND.—This island is about 75 miles in length from cape Keith westward to cape Van Diemen, and 38 miles in extreme breadth. The north coast is indented by several bays, and on the western side in Apsley strait there is a good harbour, port Cockburn. The only exploration of the island was made in 1887, when a party from port Darwin landed about 22 miles eastward of cape Gambier and crossed to Brenton bay. The timber, soil and animals were found to be the same as those of the main land.

Natives.—The natives on Melville island are said to be very fierce and hostile to Europeans (1887).

Cape Gambier is a low mangrove point forming the south extreme of Melville island ; it is fronted by a reef (of conglomerate coral and ironstone) $1\frac{1}{2}$ miles wide, which continues to the north-westward for $3\frac{1}{2}$ miles. In the middle of the bight, about 5 miles to the westward is Maclear creek marked by tall casuarinas. This locality seems much frequented by the natives, and by buffaloes. About one mile westward of Maclear creek there is a long beach of white sand fronted by very

See charts, Nos. 1,095 [2,988] and 613 [2,987].

shallow water, which dries out one mile at low water; this bank appeared to extend as far as Apsley strait. Off this shore there are many sand banks.

From cape Gambier the coast trends north-eastward for 35 miles to cape Keith; it has only been partly surveyed for a distance of 22 miles, and consists thus far, in general, of low wooded country with sandy beaches fronted by shallow water. A ridge of hills between 200 and 300 feet high runs parallel with the coast at about 4 or 5 miles inland. The most conspicuous feature of the coast is a light red cliff 16 miles from cape Gambier; this cliff, about 30 feet in height, was named Ant cliff by Stokes.

From cape Keith a bay extends north-eastward for 10 miles to the east point of Melville island, and is 3 miles deep. The sunken patches, noticed on page 536, lie in front of the bay, and a hill, 320 feet high, rises within the shore, at about 5 miles to the north-westward of the cape.

The coast, from the east point of Melville island, takes a general north-west direction for 21 miles to Jahleel point; it is low, thickly wooded, and is in most parts fronted by rocks. At about 5 miles from Jahleel point is cape Fleeming, the north-east extreme of the island; and between cape Fleeming and Jahleel point are two small bays, separated by a rocky point, with a sunken patch close off it.

Elphinstone reef is reported to lie about 2 miles northward of cape Fleeming.

Brenton bay, 8 miles south-westward from Jahleel point, terminates in a creek or stream of fresh water; but the western shore being bordered by a reef, and the water shallow, the bay affords no good anchorage.

Lethbridge bay, 18 miles from Jahleel point, although open to the north-west, affords tolerably sheltered anchorage in the south-east monsoon; the beach is sandy, but is probably fronted by rocky ground. In the bight of the bay is a fresh water stream; and on the western shore there is a range of cliffs, the upper half of which are red and the lower white. At about 4 miles to the north-eastward of the rocky west point of the bay are the Madford shoals, two patches of rock on which the sea breaks.

Karslake islet is connected by a reef with a projecting point, separating Snake and Shark bays, with a small opening in the bight of each like those in Brenton and Lethbridge bays.

Cook reef, 5 miles north-westward from Karslake islet, is a small sunken patch, lying close off the east side of a point of land, projecting from slightly higher land than that on either side of it. On the west side of this point is a bay, between which and cape Van Diemen is a range of white cliffs about 100 feet high and 7 miles in length; these are the more remarkable from being even whiter than the usual colour of the pipe clay cliffs to the eastward.

Aspect.—The hills and coast are wooded to the edges of the cliffs and sandy beaches that vary the outline and appearance of the northern shores of Melville island; the most unproductive part appears to be the narrow tongue extending to cape Van Diemen.

Cape Van Diemen and Mermaid shoal.—Cape Van Diemen terminates in a low sandy point, with a rocky spit extending 5 miles to the north-westward, on which are some sand banks dry at half tide. From this spit and the west side of the cape, as far as Piper head—a steep red and white cliffy projection, 6 miles to the southward—the Mermaid shoal extends to the westward, apparently about 16 miles. The northern edge of the Mermaid shoal is described by Captain King as rather steep-to, with over-falls in from 4 to 10 fathoms near its edge. Near its southern edge, at 5 miles to the westward of Piper head is a sand bank, dry at low water, and between one and $2\frac{1}{2}$ miles to the south-westward of the head are two patches of rocks, also dry at low water, with a covered reef close to the south-eastward of the eastern patch.

Marie shoal, of sand and coral, is 2 miles long N.N.W. and S.S.E., and one mile wide, with a general depth of from 5 to 7 fathoms over it. The least depth is 20 feet, situated about the middle of its western edge in approximately lat. $10^{\circ} 55\frac{1}{4}'$ S., long. $130^{\circ} 6\frac{1}{4}'$ E., and about 18 miles N.W. $\frac{1}{4}$ W. of cape Van Diemen, the north point of Melville island. This shoal is surrounded by depths of 25 and 35 fathoms.

Tidal streams.—At Marie shoal the rising tide sets to the S.W. at the rate of $1\frac{1}{2}$ knots an hour, and falling tide to the N.E. at the rate of $1\frac{1}{4}$ knots.

Parry shoal with depths of 5 to 8 fathoms, sand and coral, is about 4 miles in length E. by N. and W. by S., with a breadth of half a mile. The shoalest spot known, about one mile from its western end, is in lat. $11^{\circ} 9\frac{1}{4}'$ S., long. $129^{\circ} 39'$ E.

ST. ASAPH BAY.—The Narrows.—The dangers already described as being situated near the south-eastern edge of the Mermaid shoal form the northern side of the entrance of St Asaph bay, which is contracted to scarcely $1\frac{1}{4}$ miles in breadth by a sandy spit, dry at low water, projecting N.N.W. $2\frac{1}{4}$ miles from Brace point. A shoal extends for about 5 miles to the westward of this spit, the limits of which have not been determined.

Brace point, the north extreme of Bathurst island, is nearly isolated at high water by a mangrove swamp.

St. Asaph bay forms the northern entrance of Apsley strait, which separates Melville and Bathurst islands; it extends north and south 5 miles and is nearly the same distance across, from Brace point to the opposite shore. The eastern shore consists of a series of rocky points, red cliffs, and

See chart, No. 613 [2,987]; and plan of St. Asaph bay, No. 1,046 [2,992].

shallow bights between Piper and Luxmoore heads. At about midway is a shallow bight, the mangrove flat behind it being apparently overflowed by the tide. The whole of the eastern shore is fronted by a rocky reef, from half a mile to one mile wide, and the land is generally low and well wooded.

St. Asaph bay is sheltered on the western side by Brace point and the sandy spit extending to the northward of it.

Depths.—Anchorage.—The approach to St Asaph bay, between Mermaid shoal and the shallow water extending to the westward from Brace point, has never been closely sounded, but from the west extreme of Mermaid shoal to about 5 miles to the southward of it, the depths range from 12 to 20 fathoms; thence the depth decreases to the eastward varying from 7 to $3\frac{1}{4}$ fathoms, until Brace point bears S.E. when it increases from 8 to 23 fathoms through the Narrows.

The depth of water in St Asaph bay is generally regular, varying from 3 to 18 fathoms, the deeper water being on the western side; but the best anchorage is on the east side, out of the influence of the tidal stream.

Directions.—Vessels entering St. Asaph bay from the westward should proceed on the parallel of $11^{\circ} 15'$ S. until the north extreme of Bathurst island is seen; when the west visible extreme of the island bears South, the vessel will be nearly abreast of the west extreme of Mermaid shoal. The mark to clear the shoals on either hand is the south wooded end of Piper head bearing E. $\frac{1}{4}$ N., until the water deepens to 8 and 9 fathoms. The vessel will then be near the Narrows, and may steer about E.S.E. for St. Asaph bay, due allowance being made for the tidal stream; and when proceeding in against the ebb give berth to the sandy spit projecting from Brace point, while it is covered, as the stream then runs over it with considerable strength.

Tides.—It is high water, full and change, in St. Asaph bay, at 5h. 45m.; rise 14 feet. At the west entrance of the Narrows the flood sets to the eastward, and the ebb to the westward, at the rate of 2 knots an hour.

PORT COCKBURN is a portion of Apsley strait between St Asaph bay and Harris isle, 6 miles within Luxmoore head. Eastward of Tamar point, the south extreme of Luxmoore head, is Lambert river, a narrow winding stream, which was traced from 3 to 4 miles south-eastward through low land, thickly covered with mangroves. The average depth of water for $2\frac{1}{2}$ miles above the entrance is 2 fathoms, but there is a depth of only 3 feet on the flat which bars the entrance of the river.

From Lambert river the shore, backed by a coast range of moderate elevation, trends southward 3 miles to Garden point, the north extreme of Kings cove.

Reef.—From Luxmoore head to Tamar point the cliffy headland is bordered by a reef about a quarter of a mile wide, but between Tamar and

Garden points the shore is fronted by a reef the outer edge of which forms nearly a direct line from point to point. A small patch lies close to the edge of this reef, at 2 miles southward of Tamar point.

Kings cove, situated between Garden and Barlow points, is about half a mile in extent, and appears to afford good anchorage in depths of from 4 to 10 fathoms, mud. Fort Dundas was a small military post established on Barlow point, at the south extreme of the cove, by the British Government in 1824, but was abandoned in 1840.

The west shore of port Cockburn, from the creek abreast of Luxmoore head, southward for 5 miles to Interview point, is bordered by a reef, dry at low water, with a low sandy islet near the shore, at about midway between the creek and point. A level range of wooded hills rises from the northern portion of this shore, visible at a distance of 20 miles.

Close to the southward of Interview point is Intercourse river, winding westward into a low mangrove flat, and carrying depths of from 3 fathoms to one fathom for a distance of 3 miles up from the entrance. This stream flows into a small bay opposite Kings cove, so encumbered with shoals as only to leave a narrow one-fathom channel to the entrance of the river.

The natives about port Cockburn were formerly found to be hostile.

Tides.—It is high water, full and change, in port Cockburn, at 5h. 45m; springs rise about 14 feet. The streams run with a velocity of 2 to 4 knots in Apsley strait; the flood comes from the northward.

APSLEY STRAIT, of which St. Asaph bay and port Cockburn form the northern portion, separates Melville from Bathurst island, and is $1\frac{1}{4}$ miles broad, between Barlow point and the opposite shore, at Sinclair point; but close to the southward it is divided into two channels by Harris isle and its surrounding reef. Mermaid channel, on the east side, is half a mile wide, with deep water, but the passage to the westward of the island is more narrow and apparently shallow.

Apsley strait to the southward of port Cockburn, takes a general southeasterly direction from Harris isle, for 31 miles, and averages about $1\frac{1}{2}$ miles in breadth, with from 10 to 13 fathoms water, but the depth near its southern entrance is very irregular, the channel being thickly studded with rocks and shoals, in many places dry at low water, the spaces between them being too intricate even for a small vessel. These dangers, together with the strong tidal streams, which sometimes run at the rate of 4 knots an hour, render Apsley strait impracticable as a navigable channel for sailing vessels.

The shore on either side of Apsley strait is generally low and thickly covered with mangroves, without any other object worthy of notice than two navigable rivers or creeks, with clear entrances; one at $1\frac{1}{2}$ miles, and the other at 6 miles to the southward of Barlow point. The former was

traced nearly 5 miles in a south-east direction to the base of a hill on which were some high trees, and was found to be nearly half a mile wide, carrying a depth of from 8 to 5 fathoms. The latter—Bremer river—takes an E.N.E. direction for about the same distance, but it has only 3 fathoms in the entrance; within it, the depth varies from 4 to 7 fathoms for a distance of nearly 3 miles up, and then decreases from 3 fathoms to one fathom. Both rivers flow through low mangrove flats, covered at high water.

The country on either side of Apsley strait is generally low and thickly wooded. In the more open parts the sago and fan-palm, the pandanus, and other trees are found, together with the gum tree, which, as usual, appears to be the most numerous. The soil in the neighbourhood of port Cockburn has been described as very fertile; fresh water has been found abundant in the month of October.

The southern entrance of Apsley strait, which is only half a mile broad, may be recognised by the remarkable flat-topped summit of one of the Buchanan islets, which lie close off the entrance, and north-westward 20 miles from cape Gambier. The coast between these islets and the cape has not been closely examined.

BATHURST ISLAND is about 30 miles in extent, the northern part being visible 21 miles in clear weather; its sides form nearly an equilateral triangle. The north-west coast from Brace point to Rocky point at 16 miles to the south-westward, is fronted by extensive shoals, the outer limits of which have not been determined; but it is probable they extend from 3 to 4 miles from the land.

Gordon bay is an indentation of the west coast of Bathurst island, between Rocky point and cape Helvetius. The south shore of the bay is formed by a sandy beach, terminating to the eastward at the Twin cliffs, between which is a sandy cove where wood and probably water may be procured. Gordon bay affords good shelter in the easterly monsoon.

A shoal, with a depth of 5 fathoms, is charted as lying N.N.W. $\frac{1}{4}$ W., distant 5 miles from cape Helvetius, in the approach to Gordon bay.

A reef projects about 3 miles, and shoal water probably for 5 miles farther to the south-west from the north point of Gordon bay; a small islet near the shore, on a rocky spit, lies 5 miles to the southward.

Port Hurd is merely a salt-water inlet at the head of Gordon bay, penetrating in a south-east direction for about 8 miles. The entrance, which is between two low points, is three-quarters of a mile wide, and fronted by a bar 4 miles off, with 11 feet water on it. In the entrance there is a depth of 12 fathoms, within which the port is $2\frac{1}{4}$ miles in breadth; it then gradually narrows to about a quarter of a mile, with a depth of 4 to 5 fathoms. The shores are low and thickly covered with mangroves, affording no landing place. Several wooded hills face the entrance, one of

which—mount Hurd—kept in the opening between the two points, is the mark for crossing the deepest part of the bar.

Capes Helvetius and Fourcroy.—From cape Helvetius the coast trends southward 11 miles to cape Fourcroy, and consists of cliffs of a very dark red colour, with a remarkable projecting sand-hill at about midway between the capes. The country is thickly wooded, but very low, except where some ranges of hills rise to the height of about 200 feet.

The south coast of Bathurst island extends nearly in a direct line eastward 42 miles from cape Fourcroy to the Buchanan islets. Near the cape are some sand-hills, but to the eastward the low coast is backed by wooded hills. Mount Penguin, 420 feet high, about 10 miles eastward of cape Fourcroy, is conical and conspicuous; it forms a good landmark in approaching the coast.

Doubtful dangers.—Wanganui rock was reported, in 1883, to lie with cape Helvetius bearing E. by S., distant 3 miles. The position of this danger is very doubtful.

Shoals.—The British steamer *Northern* touched on a shoal with cape Fourcroy bearing N. by W., distant 3 or 4 miles; as it was very dark at the time the vessel struck, this bearing can only be considered approximate. Heavy breakers were seen in 1886 at the position of the shoal marked 9-fathoms on the chart, as lying S.E. by E. distant $5\frac{1}{2}$ miles from cape Fourcroy.

Again, in 1886, the *Afghan* passed over a shoal—depth of water not stated—lying with cape Fourcroy N. 40° W.; a hill to the eastward of the cape N. 2° W.; and Sandy Peak hills N. 20° E. (This is indefinite and not charted.)

Caution.—As other shoal ground may exist in the neighbourhood, vessels are recommended to give cape Fourcroy a berth of 8 miles.

PORT DARWIN is an islet of considerable size, available for all classes of vessels, there being a depth of not less than 7 fathoms in the approach, with deeper water within. It is at present and probably will continue to be the principal port in the northern part of Australia. It is here that the submarine telegraph cables from Java are landed, and it is the port of call for the principal lines of steam-vessels communicating with China, Singapore, Java, and India.

Palmerston is the capital. See p. 561.

Landmarks.—The general appearance of the land in the neighbourhood, from Charles point on the west to Lee point on the east, between which is the entrance to port Darwin, is low and flat, no part near the coast rising to a height of more than about 100 feet. It is thickly wooded, chiefly with gum trees, and bamboos and mangroves close to the water's edge, and

See charts, Nos. 613 [2,987] and 18 [2,990].

is almost devoid of natural landmarks. The land within Charles point is about 100 feet in height, and with the lighthouse on the point may possibly be distinguished at some distance.

King's table and Flag hill, between West and Middle arms, at the head of the port, are the only conspicuous rising grounds in the neighbourhood of port Darwin. The former is flat-topped and 190 feet in height; the latter rises to a peak 150 feet high. Both are densely wooded. The peaked clump of bushes on Middle point, is 120 feet high and not very conspicuous.

Dangers.—Between Lee and East points the coast is fronted by sand and mud flats, which dry to a distance of nearly 2 miles at low water springs, with depths of one to 3 fathoms for a further distance of about 2 miles. The west side of the bank forms the east side of the entrance to port Darwin, and its outer extreme, with a depth of 3 fathoms, lies with East point bearing S.E. by S., distant $4\frac{1}{10}$ miles.

East point, 20 feet high, is fronted by a reef, and also by the tail of Middle ground shoal, and by Channel rock. Between Channel rock and the shoals off West point there is a good deep channel one mile wide, forming the entrance to port Darwin.

Middle ground is an extensive bank on which the depth varies from $2\frac{1}{4}$ to 5 fathoms. The southern part of this bank lies about $1\frac{1}{2}$ miles W.S.W. of East point, and is connected with it by a ridge having depths of less than 5 fathoms; from this position the bank extends 4 miles in a north-west direction.

Channel rock is a small rocky patch on which there is a depth of $3\frac{1}{2}$ fathoms. It lies nearly 2 miles W. by S. from East point, and $1\frac{1}{4}$ miles N.E. $\frac{1}{4}$ N. from West point, and is the outermost of the numerous shoals which extend from East point.

This danger is usually indicated by tide rips.

Clearing mark.—The peaked bush on Middle point, open of Emery point, bearing S.E. $\frac{1}{4}$ S., leads close to the westward of Channel rock.

CHARLES POINT is low and flanked on its eastern side by a low reddish coloured cliff.

The coast from Charles point to West point, at the entrance to the port, is low and fronted by shelving rocks, with shallow water to the distance of one to $1\frac{1}{4}$ miles.

LIGHT.—From an iron structure, painted in red and white horizontal bands, erected on Charles point, is exhibited at an elevation of 121 feet above high water, a *revolving* light, attaining its greatest brilliancy *every half minute*, and visible in clear weather from a distance of 17 miles.

See plan of port Darwin, No. 925 [2,991].

It shows *green* from N. 22° E. to N. 82° E. over Fish reef and adjacent dangers; *white* from N. 82° E. through east and south to S. 57° W.; and *red* from S. 57° W. through west to N. 81° W.; in other directions it is obscured.

Charles point patches.—Foul ground, about 2 miles in length, on which the depth varies from $3\frac{1}{4}$ to 5 fathoms, lies about $3\frac{1}{2}$ miles north-eastward of Charles point. Its position is generally marked by tide ripples.

West point.—The shoals which extend off West point, portions of which dry 4 feet at low water, project more than half a mile to the north-eastward of the point, and thence follow the trend of the coast to the north-westward; the outer edge, of 3 fathoms and less water, being at a distance of one to $1\frac{3}{4}$ miles from the shore.

Emery point, 3 miles south of East point, is a small cliffy promontory of white and red colour, about 20 feet high and covered with bushes. Fanny bay, between East and Emery points, affords anchorage for small craft in 2 fathoms. On the shore of Fanny bay, above the prison, there is a look-out house, from which information of vessels arriving is signalled to the town.

LIGHT.—From a white building on Emery point, a *fixed white* light is exhibited at an elevation of 65 feet above high water, visible in clear weather at a distance of 6 miles, from S.S.E. $\frac{1}{4}$ E. through east to N.N.W. $\frac{1}{2}$ W. This is a temporary light.

A *fixed* light, of greater power, with *red* and *white* sectors is proposed.

From Emery point the coast fronts Palmerston, trending eastward for 2 miles to Fort hill, a somewhat similar promontory but 72 feet high; here the harbour is divided into three arms, described below.

A sand and mud flat, which dries 6 feet in places, extends in a N.N.W. direction for 2 miles from Emery point across Fanny bay, and is steep-to.

A **patch**, about 3 cables in extent, with $3\frac{1}{4}$ fathoms least water, lies 4 cables off Palmerston, W. $\frac{3}{4}$ N., distant $1\frac{1}{6}$ miles from Fort point.

The **East arm** is about 2 miles broad between Fort hill and Middle point, but the available width is reduced one half by a mud flat and shallow water off Middle point. This arm contains the principal anchorage, the railway, and landing jetties (page 558); the settlement of Palmerston being on the height above. The arm is sheltered from north-west winds by Fort hill, and has a depth of 6 to 14 fathoms. Frances bay, the northern part of it, is occupied by a mud flat.

A sunken rock, of small extent, with a depth of 9 feet over it at low water, and steep-to, lies W. $\frac{2}{3}$ N., distant $6\frac{1}{6}$ cables from the centre of North Shell island; its northern edge is marked by a cheese-shaped buoy, painted black.

An iron beacon marks the northern edge of the mud flats projecting from Middle point; it is situated with the flat-topped hill on the point bearing S. 22° E.

Vessels should not approach the beacon within 3 cables at low water.

The survey of the harbour in 1885 extended to a distance of 4 miles above Fort hill; at this point the East arm is nearly blocked by shoals and rocks. The boats of the *Beagle*, in 1839, traced the arm in a S.E. by E. direction for 6 miles, the utmost distance at which it was found navigable for a boat.

Virginia settlement is situated on the north shore of East arm, about 16 miles from Palmerston.

The Middle arm.—Buoyage.—Middle arm, which is the most extensive of the three, is separated from the East arm by Middle point, with a flat-topped hill, 120 feet high, one mile within its extremity, and a shoal extending nearly 2 miles towards Palmerston. A small black can buoy marks the one-fathom north-west edge of the shoal. A depth of 3 fathoms only will be found 3 cables north-west of the buoy. H.M.S. *Myrmidon's* survey, in 1885, only extended as far as the peaked-bush hill.

The arm is 3 miles wide at this point, but $1\frac{1}{2}$ miles farther south lies Channel island, with only a narrow passage between it and reefs westward and south-westward of it. At 3 miles above Channel island the Middle arm divides into two branches; one trends south-eastward from the island for 8 miles, passing between groups of haycock-shaped hills, about 250 feet high, to another islet; from this point it curves to the southward for 7 miles, as far as the town of Southport, which is in communication with Palmerston by steam launch. Above Southport the channel becomes too narrow and shallow for a boat to proceed.

The other branch of the Middle arm was traced in a S.S.E. direction for 3 miles, and then S.S.W. for about the same distance.

The West arm is a narrow winding creek trending in a general southerly direction for 9 miles. Its entrance lies abreast Tale head, and is formed by extensive mud flats dry from 2 to 8 feet at low water in places; those on the eastern side extend $3\frac{1}{2}$ miles northward of the point which separates West from Middle arm. A bank, with from $3\frac{1}{2}$ to 5 fathoms, extends nearly one mile E.N.E. from the northern extreme of the outer mud flat.

The bar, with about 2 fathoms water, is abreast the point northward of King's table hill, and there is the same depth of water for 3 or 4 miles up the channel.

The shores are densely covered with mangroves, the adjacent wooded country being low and level, except where varied by small conical hills.

Alligators are numerous in the arms of port Darwin, as also in the rivers to the eastward.

Talc head, on the western side of the entrance of port Darwin, is a small clifly promontory, 75 feet high, covered with thick bushes, the neck of land joining it to the main being not more than 20 yards across at high water.

The west side of the harbour south of Talc head is much blocked by shoals, nearly all of which dry at low water springs.

Cocks inlet, situated westward of Talc head, has a low water depth of about one fathom in its entrance.

ANCHORAGE.—There is a very convenient berth W.S.W. of Fort hill in 10 fathoms; this anchorage is, however, exposed in north-westerly gales. The best anchorage for merchant vessels is in a depth of 6 to 10 fathoms, mud, about a quarter to half a mile south-eastward of Fort hill. The holding ground is good everywhere, but the farther a vessel is from the shore, the stronger she will feel the tidal streams, which attain a velocity of 5 knots at springs; vessels remaining more than two days should moor with open hawse to the north-west. *See remarks on East arm, p. 556.*

Telegraph cables. — Caution. — Great caution should be observed, if taking up an anchorage near the line of the submarine telegraph cables, as vessels sometimes drag before bringing up. The shore ends are landed on the mud flat below the Residency, on the south extreme of the tableland on which the town of Palmerston stands. Beacons mark the direction of them. The route of the cables for about 2 miles seaward of the landing place is shown on the plan; they are led out to the northward of Charles point.

The cable is very heavy, and could not be lifted by any small craft, though it might be injured; commanders and owners of ships are subject to heavy damages if the cable is negligently fouled.

Jetties.—The railway jetty which projects from the foot of Stokes hill, 3 cables north-east of Fort hill, is constructed of wooden piles, and is 1,120 feet in length; the inner portion for a length of 670 feet is 20 feet wide; and the outer portion 55 feet wide. The depth alongside at low water springs, varies from 38 feet at the extreme of the jetty to 25 feet at the outer end of the narrow portion. The floor of the jetty is 6 feet above the level of high water, and is fitted with mooring bollards and chains. There are landing steps at the inner end of the wide portion on the west side.

The landing pier, close east of Fort hill, is roughly constructed of stone and piles, and extends to low-water mark. There are no facilities for landing cargo, but boats of less than 3 feet draught can lie afloat at the pier;

See plan, No. 925 [2,991].

coasting schooners lie on the mud alongside and discharge. The pier is partly covered at high water, the end of it being marked by a triangle and ball painted white.

There is another pier of similar construction on the western side of Fort hill; but the end of this pier is not marked.

There are warping buoys in the approach to the railway jetty.

Light.—Railway jetty.—A *fixed white* light is exhibited on the outer end of the railway jetty, visible in clear weather at a distance of about 4 miles.

DIRECTIONS.—In approaching port Darwin from the eastward a course should be steered to pass westward of the shoal water that extends seaward of Lee and East points, care being taken not to bring Lee point to bear northward of East until Emery point bears S.S.E. When Peaked bush hill on Middle point is well open of Emery point bearing S.E. $\frac{1}{4}$ S., steer for it, which course will lead in the fairway westward of Middle ground and of Channel rock.

Give Emery point a moderate berth, and keep westward of the fairway line until Fort hill bears East, in order to avoid the 3 $\frac{1}{2}$ -fathoms patch lying one mile S.E. $\frac{1}{4}$ S. from Emery point; course may then be altered for the anchorage off Fort hill.

When beating into the harbour, having cleared the Middle ground and Channel rock, Channel island should not be shut in by Emery point, to avoid the dangers in Fanny bay.

Coming from the westward vessels are recommended to make cape Fourcroy, the south-west point of Bathurst island, to avoid Lorna shoals, (page 562), of 4 fathoms, and ground that has not yet been examined; they should then shape course for port Darwin, proper allowance being made for the tides which run very strong during springs:—the stream of rising tide to the eastward, and of falling tide to the westward.

In standing across from cape Fourcroy, Charles point will be sighted. The point may be known by its being the highest land on that part of the coast, and by the lighthouse which stands upon it. It should not be approached within 4 miles, which distance from the shore should be kept until Peaked hill, on Middle point, is only a little open of Emery point, when proceed as from the eastward.

At night.—Having sighted cape Charles light, a vessel will be able to maintain a safe position until daylight, or by anchoring in a convenient depth. When the new light is established on Emery point, the position can be accurately determined by cross bearings of the lights on cape Charles and this point, and the latter may be approached on a S.E. $\frac{1}{4}$ E. bearing, when anchorage could be found in the harbour.

Pilots.—Signal station.—When a vessel is signalled from the lookout on the prison in Fanny bay, the harbour master goes off to berth her. The boarding station is with Emery point bearing N. 17° W., and Talc head S. 81° W. There are neither harbour nor pilotage dues. See next paragraph.

Harbour regulations.—Quarantine.—No master or pilot shall take any vessel arriving off port Darwin farther in than the boarding station, until the health officer has given directions whether the said vessel is to perform quarantine or not. Penalties not exceeding 400*l.* may be enacted for wilful breach of the Quarantine regulations. Vessels arriving at the boarding station are to hoist the following signals:—The national ensign at the peak or ensign staff. (2.) The ship's name (Commercial code). (3.) The port from whence she arrives (Commercial code). The Customs officials may, if necessary or convenient, board a vessel before she arrives at the usual boarding station, and masters of vessels must heave-to and allow such boat or vessel to come alongside upon her displaying the Customs flag and pennant. By night the boarding officer will exhibit a blue light on requiring a vessel to heave-to. Quarantine huts are erected on Channel island.

Vessels ordered into quarantine should anchor about 4 cables north-westward of the buoy marking the shoal patch lying W. by N. of North Shell island.

Tides.—The tidal observations taken at Fort hill, are reduced to low water, ordinary springs, or to a level of 35 feet 6 inches below the top of a stone used as a datum mark at the south-west corner of a verandah of the officers' camp quarters.

The tides are somewhat irregular, but in August 1885, their action was as follows:—

High water, full and change, 5h. 43m.; mean springs rose 22 feet 4 inches; neaps 15 feet 6 inches; neap range 6 feet 9 inches.

High and low high tides, and also high and low low tides followed each other alternately. If the high water was a high one the low water following was also high and *vice versa*.

At new moon in this month the tide rose higher and fell lower than at full moon, and the highest tides followed the lower transit of the moon.

At full moon the highest high tides followed the upper transit of the moon.

Tidal streams.—Off Fort hill the streams run with considerable velocity, upwards of 5 knots per hour having been registered at springs, with but a very short interval of slack water. At neaps the rate does not exceed $2\frac{1}{2}$ knots.

See plan, No. 925 [2,991].

Proceeding towards the entrance to the harbour, the strength of the stream greatly diminishes; its direction inside the harbour is always directly through the channels in which it runs.

In a position 6 miles N.W. by N. of East point the rise and fall and direction were observed at springs. The south-going stream begins to make 6 hours before high-water and runs for 7 hours. The north-going stream begins to make at one hour after high water and runs for 5 hours. The rise and fall was found to correspond with that observed simultaneously at Fort hill, but in direction the tide was circular, with no slack interval.

Palmerston, on the eastern shore of port Darwin, is the capital of the Northern territory of South Australia. It is a town of growing importance, healthily situated on the table-land south-east of point Emery, at about 60 feet above the level of the sea and almost surrounded by it. Cool breezes blow almost constantly throughout the year, and so temper an otherwise unbearable climate. The town is laid out in blocks with streets crossing at right angles; the Resident's house and the public buildings are of stone, and most of the remaining portion of the town of wood.

A railway to the interior is completed as far as Pine creek, a distance of 150 miles.

Palmerston is connected by two submarine cables with Java (Banjuwangi), and by overland wire with Adelaide; *see* page 30.

Supplies.—Coal is brought by rail in trucks containing 5 tons, and can be put on board at low water by chutes from truck to vessel; at high water by baskets. About 200 tons are shipped in an ordinary day's work. The railway jetty is available for any sized vessel at all states of the tide. About 500 tons are usually in stock.

Fresh beef, bread, and vegetables, in limited quantities, can be procured at Palmerston at a reasonable price.

Fresh water of good quality may be obtained alongside the railway jetty from a reservoir in which many thousand gallons are stored.

There are at present no facilities for repairing vessels of any description.

Trade.—Port Darwin was formerly a free port. Since 1881 Customs duties have been imposed on spirits, wine, beer, tobacco, opium, rice, sugar, tea, rice meal, and Chinese oil. A Shipping-master is appointed for the shipping and discharge of seamen under the Marine Board Act of South Australia. The commanders of Australian ships are, however, required to report and clear their ships in the usual way before the Custom house officer, and a correct account in the form of entry must be given of all goods landed. A Magistrate's Court exists, and a body of mounted police are stationed in the territory.

Shipping.—During the year ending December 31st, 1899, the aggregate tonnage of vessels entering and cleared amounted to 189,821 tons.

Exports and Imports.—The exports of the place consist as yet principally of gold from the inland mines, mother-of-pearl shell, and horned cattle. The exports for the year ending December 31st, 1899, also comprised—trepang, horses, hides, horns, sheep, and wool. Total value, exports, 156,062*l.*; imports, 131,880*l.* The revenue is about 33,500*l.*

Population.—Palmerston district contains a population of about 600 Europeans, and of 2,000 Chinese and other Asiatics.

Communication.—*See* page 30.

Observation spot, transit pier, at the telegraph office, is in lat. 12° 28' 22" S., long. 130° 50' 37" E.

Weather.—A meteorological register with standard instruments is kept at the post office, Palmerston. On examination of the results for the five years ending 31st December 1885, it appears that north-westerly winds prevail from November to April, with occasional winds from south-east, especially at night. From April to September the south-east monsoon prevails, and is strongest in July; in October it falls light, and westerly winds are frequent.

During the south-east monsoon the weather is very hazy, and objects are frequently obscured at a distance of 3 miles. During the north-west monsoon the weather is clear; *see* also page 17.

The rainy season is from the end of October and lasts about 5 months, the greatest amount falling in January and February. From May to September, inclusive, no rain falls. The mean rainfall for 22 years is 63·5 inches, but it varies considerably; *see* page 573.

Lorna shoals, in the approach to port Darwin from the westward, consist of two patches, nearly one mile apart, north-east and south-west, with a depth of 4 fathoms over each of them and 11 to 12 fathoms close around. The sea seldom breaks on these shoals. The north-eastern shoal is about 4 cables in length, and its centre is situated in lat. 12° 20' 55" S., long. 130° 19' 20" E.

Isolated soundings of 4 to 7 fathoms are shown in many places between these shoals and the shore, rendering it advisable at all times to pass northward of the Lorna shoals.

PORT PATTERSON is an extensive harbour 15 miles to the westward of port Darwin, from which it is separated by the peninsula of which Charles point is the northern extreme, page 555. It has not been properly surveyed.

The entrance of port Patterson and Bynoe harbour is 7 miles wide, between Charles point and Fish reef, the outermost of a chain of small

sandy islands and reefs, extending in a N.N.E. direction for 15 miles from the mainland, and forming the west side of port Patterson. A reef which dries, with Middle shoal extending from it to the south-east, together, 5 miles in length and 2 miles in breadth, lies within the entrance. Between this reef and the western extreme of Charles point at $1\frac{3}{4}$ miles from the latter, is a reef which dries, and other sunken dangers. The channel on the east side of the Middle shoal is one mile wide, with a depth of 6 fathoms; the west, and better channel, is $2\frac{1}{2}$ miles wide, with from $3\frac{1}{2}$ to 7 fathoms. The upper portion of the port is divided into two arms by Indian island, and is much encumbered with shoals, for which, see the chart.

Port Patterson is about 3 miles wide, between Indian island and the reef and islets forming the west side of the port, and trends south-westward for 7 miles when it divides into two branches; one of these communicates by a narrow and shallow passage with Bynoe harbour. The other branch trends to the southward, and has depths of from 7 to 3 fathoms for a distance of about 3 miles up from its entrance.

A chain of small sand islands upon the reef forming the west side of port Patterson, extends north-eastward 5 miles to Grose islet, which is 30 feet high. At one mile to the north-eastward of Grose islet, in the fairway of port Patterson, there is a small detached patch.

The shores of port Patterson are low and covered with mangroves, but there appears to be some fertile land at the head of Bynoe harbour. The most elevated land near the port is about 200 feet high; but no detached conical hills, as noticed at port Darwin, were seen in this neighbourhood.

Quail islet, 3 miles northward of Grose isle, is situated near the northern extreme of the same reef forming the basis of the other islands, which all produce a few small trees and a little brushwood. Although Quail islet is only 35 feet high, and composed entirely of sand, a native well of excellent water was found near the centre of the islet by H.M.S. *Beagle*, in the month of September. The reef being continuous and partly dry at low water, Quail islet is frequented by the natives to procure turtle, which are very numerous at this season of the year.

A reef, about half a mile in extent which uncovers, lies 2 miles to the northward of Quail islet, connected with the reef surrounding that islet by foul ground; between this and Fish reef, the northernmost known danger, are many shallow patches.

Reef.—The north extreme of a reef, with several rocks above water, lies about 8 miles west-south-westward from Quail island. There is no information as to the limits of this danger.

Bynoe harbour lies eastward of port Patterson and of Indian island. It winds round south-eastward for about 15 miles, when it branches into three deep creeks, the largest of which communicates with

a chain of fresh-water holes; the north-easternmost passes at the distance of $1\frac{1}{2}$ miles from a bend of the West arm of port Darwin. The average width of Bynoe harbour is 2 miles, and the depth about 9 fathoms. Close within the entrance is a hill on the eastern shore, 150 feet high, with a small bay to the southward of it which appears to be much occupied by shoals.

Water.—Fresh water was found in Bynoe harbour at the head of the middle creek.

Directions.—The best time for entering port Patterson or Bynoe harbour is at near low water, when the reefs are showing, as the water is generally too muddy for them to be seen when covered, and the sea seldom breaks on the reefs.

Tides.—It is high water, full and change, in port Patterson at 4h. 0m; springs rise from 13 to 20 feet; neaps from 6 to 12 feet. The stream follows the direction of the channel, varying in velocity from one to 2 knots. The ebb in the offing sets W.N.W.

THE COAST from Quail island at the northern end of the chain of islands forming the western side of port Patterson, trends south-westward for about 27 miles to Blaze point with Fog bay lying between. This coast is so low that it is not visible at a distance greater than 6 or 7 miles, and is dangerous to approach, as rocks and reefs extend in some places about 5 miles off shore. The land would appear quite barren, but for a few bushes or mangrove trees scattered about the beach.

From Blaze point, a low wooded point, with rocky ledges extending more than a mile off it, the coast takes a southerly direction for 21 miles to Channel point, the north-east extreme of Anson bay, where it attains a height of 80 feet a short distance inland. The land is low, but more wooded than that north-eastward of Blaze point.

Peron isles, off Channel point, are low and sandy; the north-western and larger of the two is about 7 miles in length, with a grassy peak nearly 100 feet high on its north end; the southern portion of the island is covered with mangroves. The southern island, 2 miles from Channel point, is about 3 miles in length, and surrounded by mangroves. Both islands have reefs and sandbanks off their west sides, extending to a distance of 2 to 3 miles, outside which the soundings are very uneven, and bottom rocky. The reef off the north-west end of the larger island extends upwards of one mile; and it is doubtful whether a navigable channel exists between the islands.

The channel between the Peron isles and Channel point is intricate.

A shoal, with a depth of 3 fathoms, lies N. $\frac{1}{2}$ W., distant $4\frac{1}{2}$ miles, from the north extreme of West Peron island.

Anson bay and the coast to the westward are described in *Australia Directory*, Vol. III.

See charts, Nos. 18 [2,990] and 1,044 [2,983].

APPENDIX.

TIDES IN THE PHILIPPINE ISLANDS.

The following Remarks are taken from the Spanish "Derrotero del Archipiélago Filipino 1879."

During the progress of the Spanish survey of the Philippines tidal observations were made at Corregidor, Iloilo, and Balábac; these show the influence of the diurnal wave to be as great or greater than that of the semi-diurnal wave. From these observations tables for finding the time and height of high water were constructed, in which the following laws are discernible.

Two days after the moon passes the equator two flood and two ebb tides are observed during the twenty-four hours, of approximately equal value; during the next 7 or 8 days one of the flood tides increases and the other decreases, until there is only one perceptible in the 24 hours, which single tide attains its greatest value two days after the moon has reached her greatest declination either North or South.

This single tide then decreases in range as the moon's declination decreases, and soon a second tide becomes apparent, increasing daily in range and becoming equal to the first tide two days after the moon has again crossed the equator, and so forth with successive semi-lunation.

There is no regular establishment, as the luni-tidal interval varies with the days elapsed since the moon's declination was *nil*, from $2\frac{1}{2}$ hours before the moon's transit to $2\frac{1}{2}$ hours after. The amount of interval is given in Table I.

The range of spring tides varies with the seasons, being at a maximum about the solstices, and at a minimum about the equinoxes.

The age of spring tides varies with the seasons; at the solstices the highest tide occurs on the day of new and full moon, and at the equinoxes it occurs at the moon's quarters.

TABLE FOR FINDING THE TIME AND HEIGHT OF HIGH-WATER IN MANILA BAY, AT BALÁBAC AND ILOILO.

Table I. contains the establishment of port Corregidor, at the entrance of Manila bay, according to the number of days elapsed since the moon's declination was *nil*.

From this table the time of high water can be found by the usual method, adding or subtracting the establishment of the port according to the sign in the table.

TABLE I.—ESTABLISHMENT OF THE PORT AT CORREGIDOR ISLAND.*

Days elapsed since the Moon's declination was <i>nil</i> .														
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Moon's declination North.														
$\begin{smallmatrix} + \\ h\ m \\ 10\ 10 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 10\ 26 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 1\ 20 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 1\ 34 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 1\ 50 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 2\ 7 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 2\ 24 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 2\ 36 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 2\ 41 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 2\ 46 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 2\ 46 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 2\ 40 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 2\ 30 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 2\ 22 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 2\ 17 \end{smallmatrix}$
Moon's declination South.														
$\begin{smallmatrix} - \\ h\ m \\ 2\ 12 \end{smallmatrix}$	$\begin{smallmatrix} - \\ h\ m \\ 2\ 0 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 11\ 15 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 10\ 55 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 10\ 35 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 10\ 22 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 10\ 10 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 9\ 57 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 9\ 48 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 9\ 43 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 9\ 37 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 9\ 43 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 9\ 48 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 9\ 58 \end{smallmatrix}$	$\begin{smallmatrix} + \\ h\ m \\ 10\ 4 \end{smallmatrix}$

For example (i.) :—To find the time of high water at Corregidor on the 1st of February 1890 ; the moon's declination was *nil* on the 25th January, therefore the number of days since elapsed is six, and the establishment of the port for the day according to Table I. is — 2h. 24m.; then :—

	Lower.	Upper.
	h. m.	h. m.
Moon's mer. pass. at Greenwich on 1st Feb.	9 27 a.m.,	9 51 p.m.
Correction for longitude 120° E.	- 0 16 —	0 16 —
Correction for semi-diameter 14' 45"	- 0 30 +	0 32 +
Establishment of port, Table I.	- 2 24 —	2 24 —
Time of high water at Corregidor	- 7 17 a.m.	7 43 p.m.

* The table in the "Derrotero" gives the establishment for each month ; in this work the yearly mean only is given.

Table II. contains Tidal Differences for Kavite, Balábac, and Iloilo, which being applied according to the sign + or - to the hour of high water at the standard port Corregidor, will give the hour of high water at those places.

TABLE II.—TIDAL DIFFERENCES FOR KAVITE, BALÁBAC AND ILOILO WITH REFERENCE TO STANDARD PORT CORREGIDOR.

Days elapsed since Moon's declination was <i>nil</i> .															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Moon's declination North.															
Kavite -	m -19	m -15	m -10	m -4	m +2	m +7	m +11	m +15	m +18	m +21	m +23	m +25	m +26	m +27	m +28
Balábac -	+27	+23	+19	+16	+15	+16	+18	+20	+23	+25	+27	+29	+31	+32	+32
Iloilo -	+80	+52	+40	+33	+25	+22	+20	+24	+28	+38	+50	+74	+110	+106	+98
Moon's declination South.															
Kavite -	m +28	m +27	m +25	m +22	m +18	m +15	m +10	m +5	m +1	m -4	m -11	m -17	m -19	m -20	m -19
Balábac -	+32	+32	+30	+26	+20	+13	+9	+8	+10	+12	+14	+17	+20	+24	+27
Iloilo -	+90	+76	+66	+56	+48	+41	+33	+24	+20	+25	+36	+52	+68	+84	+82

For example (ii) :—If the time of high water at Corregidor is 7h. 17m. on the 6th day after the moon's declination was *nil*, the correction to be applied for Kavite from Table II. is + 11m., and the time of high water at Kavite will be 7h. 28m.

Table III. gives the height of the highest tide daily above the mean level of the sea at Corregidor; this height should be corrected from Table IV. for the apparent semi-diameter of the moon.

For Kavite, Balábac, and Iloilo the height of high water may be found *approximately* by multiplying the height at Corregidor by 1.1 for Kavite, 1.3 for Balábac, and 1.6 for Iloilo.

TABLE III.—HEIGHT OF HIGHEST TIDE DAILY ABOVE THE MEAN LEVEL OF THE SEA AT CORREGIDOR.

Month.	Days elapsed since Moon's declination was <i>nil</i> .														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
January	10	09	06	09	10	13	16	19	20	20	20	19	16	16	13
February	13	10	09	06	08	09	10	13	16	16	19	16	16	13	13
March	10	09	06	09	10	13	13	14	16	16	16	14	13	10	09
April	06	06	09	13	16	19	20	20	20	19	16	14	13	10	09
May	09	06	10	13	16	19	20	23	23	23	20	19	16	13	10
June	10	09	09	13	16	20	23	26	29	29	26	23	20	20	19
July	19	13	10	10	13	19	20	23	26	29	29	26	23	23	20
August	20	16	13	10	13	16	19	20	23	26	26	29	26	23	20
September	19	16	13	13	16	19	20	20	23	23	23	20	20	20	19
October	13	13	16	19	20	20	20	20	20	20	20	19	16	16	13
November	10	09	13	16	19	20	23	23	23	23	20	19	16	13	10
December	09	09	10	13	16	19	20	23	23	23	20	20	19	13	10

TABLE IV.—CORRECTION TO THE HEIGHT OF HIGH WATER FOR THE SEMI-DIAMETER OF THE MOON.

Moon's Semi-diameter.	Correc- tion.	Moon's Semi-diameter.	Correc- tion.	Moon's Semi-diameter.	Correc- tion.	Moon's Semi-diameter.	Correc- tion.
14 44	- 5 in.	15 20	- 2 in.	15 56	+ 1 in.	16 32	+ 4 in.
14 56	- 4 "	15 32	- 1 "	16 8	+ 2 "	16 44	+ 5 "
15 8	- 3 "	15 44	0 "	16 20	+ 3 "		

For example (iii) :—To find the height of the highest high water above the mean level of the sea at Corregidor on the 1st of February 1690, six days having elapsed since the moon's declination was *nil*, and the moon's semi-diameter being 14' 44". The height of high water in Table III. is one foot, and the correction in Table IV. for semi-diameter is - 5 inches, therefore the rise of the highest tide on that day is 0 ft. 7 in. As the higher water of each day follows the moon's lower transit when she has North declination, the a.m. tide will be the highest. See example (i).

TABLES FOR FINDING THE HOUR OF HIGH AND LOW WATER, AND THE HEIGHT ABOVE THE MEAN LEVEL OF THE SEA ON THE SOUTH COAST OF MINDANAO DURING THE PERIOD FROM SPRINGS TO NEAPS.

Table I. contains the correction to "mean establishment" for Samboanga Isabela, Pollok, and Davao, which should be applied according to the sign + or —. The table is constructed for the mean parallax 57'; for every 1' of parallax less or greater than 57' the correction should be increased or diminished by $\frac{1}{3}$ of its value.

The "mean establishment" for Samboanga is 6h. 54m.; for Isabela 8h. 18m.; and for Pollok and Davao 6h. 5m.

TABLE I.—CORRECTION TO "MEAN ESTABLISHMENT."

Hour of transit	Moon's	h	h	h	h	h	h	h	h	h	h	h	h
	-	0	1	2	3	4	5	6	7	8	9	10	11
Correction, minutes	-	m	m	m	m	m	m	m	m	m	m	m	m
	-	+23	+6	-25	-47	-67	-78	-42	+18	+53	+70	+58	+37

For example (i) :—To find the time of high water at Samboanga on the 1st February 1890.

	Upper.	Lower.
	h. m.	h. m.
Moon's mer. pass. at Greenwich 31st Jan.	9 2 p.m., 1st Feb.	9 27 a.m.
Correction for long. 122° E.	- 17—	17—

Moon's mer. pass. at Samboanga - 8 45 p.m. 9 10 a.m.

"Mean establishment," 6h 54m.; correction from Table I., + 1h. 6m.; corrected establishment, 8h. 0m.; then :—

	h. m.	h. m.
Moon's mer. pass. at Samboanga 31st Jan.	8 45 p.m., 1st Feb.	9 10 a.m.
Corrected establishment	- 8 0	8 0
Time of high water, 1st Feb.	- 4 45 a.m.	5 10 p.m.

Table II. contains the amount of reduction, according to the hour of moon's transit, to be subtracted from half mean spring range in order to obtain the height of semi-diurnal high water for the period intermediate between springs and neaps.

The half mean spring range for Samboanga is about 2 feet; for Isabela about one foot; for Pollok 4 feet; and for Davao 3½ feet.

TABLE II.—REDUCTION TO THE HEIGHTS OF SPRING TIDES.

Hour of transit	Moon's -	h 0	h 1	h 2	h 3	h 4	h 5	h 6	h 7	h 8	h 9	h 10	h 11
Samboanga	-	in. 2	in. 0	in. 0	in. 2	in. 4	in. 8	in. 12	in. 12	in. 10	in. 9	in. 6	in. 3
Isabela	-	1	0	0	1	2	4	6	6	6	5	3	2
Pollok	-	2	0	0	4	9	16	22	25	23	18	10	5
Davao	-	2	0	0	3	8	14	20	22	20	16	10	5

Table III. contains a correction to the height of semi-diurnal high tides for diurnal inequality, and should be applied as follows;—for moon's declination North add to the tide following the moon's lower transit, and subtract from the tide following the upper transit; for moon's declination South, add to the tide following the moon's upper transit, and subtract from the tide following the lower transit.

The correction for parallax is inconsiderable, amounting to less than an inch as maximum.

TABLE III.—CORRECTION TO THE HEIGHT OF SEMI-DIURNAL HIGH WATER FOR DIURNAL INEQUALITY.

Moon's declination.		0°	5°	10°	15°	20°	25°	28½°
Samboanga	December, January, June, July	in. 0	in. 4	in. 7	in. 11	in. 14	in. 17	in. 20
	February, May, August, November	-	0	3	5	9	12	15
	March, April, September, October	-	0	2	5	8	10	14
Isabela	December, January, June, July	-	0	3	10	15	20	23
	February, May, August, November	-	0	4	7	12	17	20
	March, April, September, October	-	0	3	6	11	14	17
Pollok	December, January, June, July	-	0	3	5	8	10	13
	February, May, August, November	-	0	2	4	6	9	11
	March, April, September, October	-	0	2	3	5	7	9
Davao	December, January, June, July	-	0	2	4	6	9	10
	February, May, August, November	-	0	2	3	5	7	9
	March, April, September, October	-	0	2	3	4	6	7

For example (ii) :—To find the height of high water above the mean level of the sea at Samboanga on the 1st February 1890; the reduction from Table II. for moon's mer. pass. 7h. is — 12 inches, and the

correction from Table III. for moon's declination 23° N., is + 14 inches for the tide following the moon's lower transit, and - 14 inches for the tide following the moon's upper transit; then :—

	Lower.		Upper.	
	ft.	in.	ft.	in.
Half mean spring range, Samboanga - - -	- 2	0	2	0
Reduction from Table II. mer. pass. 7h. - -	- 1	0—	1	0—
Correction from Table III. decl. 23° N. - -	- 1	2+	1	2—
<hr/>				
Height of high water following moon's transit	- 2	2	0	2—

That is :—The high tide following the upper transit does not rise to the mean level by 2 inches.

Table IV. contains a correction to the time of semi-diurnal low water for diurnal inequality. In applying this correction it should be remembered that the low tide which precedes the highest tide of the day is in advance, while that which follows it is delayed. The sign (*) in the table indicates that for the corresponding declination of the moon there is but one tide in the day.

TABLE IV.—CORRECTION TO THE TIME OF SEMI-DIURNAL LOW WATER FOR DIURNAL INEQUALITY IN MINUTES.

Moon's declination.		0°	5°	10°	15°	20°	25°	28½°
Samboanga {	Full and change - - - -	m 0	m 10	m 15	m 20	m 24	m 26	m 30
	Three days after full and change - -	0	11	18	25	30	41	48
	Quarters - - - -	0	32	48	•	•	•	•
Pollok and Davao—Mean correction - - -		0	4	7	10	13	16	18

For example (iii) :—To find the time of low water at Samboanga on the 1st February 1890. The highest high water of that day being at 5h. 10m. p.m. (*see* example i.), then :—

		h.	m.	h.	m.
Approximate times of low water - -		10	57 a.m.	11	22 p.m.
Correction from Table IV. - -		-	10 advance	-	10 retard
<hr/>					
Times of low water - -		-	10 47 a.m.	-	11 32 p.m.

The correction to the height of semi-diurnal low water for diurnal inequality is inconsiderable.

PLACE.—MANILA OBSERVATORY. OBS. Δ LAT. 14° 35' N., LONG. 121° 0' E.

METEOROLOGICAL TABLE COMPILED FROM TWO TO TWENTY-TWO YEARS' OBSERVATIONS.

[illegible]

PLACE.—PORT DARWIN. Obs. Δ LAT. $12^{\circ} 28' S$, LONG. $130^{\circ} 51' E$.

METEOROLOGICAL TABLE COMPILED FROM ONE YEAR'S OBSERVATIONS (1895).

MONTH.	BAROMETER, reduced to 32° and Sea Level.		TEMPERATURE.				Relative Humidity.		RAIN.*		WIND.								REMARKS.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
	Mean Height.	Ex- treme Range.	Mean.	Mean Daily Range.	Max.	Min.	Clouds, 0 to 10.	Total Fall.	No. of Days.	Average Hourly Velocity.	Number of Days from																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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* Mean of 25 years, 1870-94:
Max. 81.7 inches in 1886;
min. 42.4 inches in 1892.

MEAN MONTHLY AND ANNUAL RAINFALL AT EIGHT COAST STATIONS.*

Place.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
Ternate	7.4	8.2	5.1	10.0	9.0	9.1	5.5	4.3	4.4	6.1	8.2	9.5	87.1
Bachian	4.7	5.6	6.3	6.9	5.4	6.5	4.1	7.4	3.1	3.8	4.1	6.7	64.6
Kayeli	9.0	7.1	9.0	6.1	5.5	10.1	7.4	4.9	1.5	2.1	2.4	6.9	71.8
Amboina	5.5	4.9	5.1	11.6	21.1	24.9	24.9	19.6	8.2	7.0	4.7	5.0	142.5
Saparua	3.7	4.3	4.5	10.6	19.6	25.7	26.3	18.2	9.0	9.2	3.4	5.3	140.0
Amahoi	4.6	4.5	5.2	11.5	12.1	14.3	19.9	18.7	8.1	7.1	4.5	4.3	110.9
Wahai	10.6	20.0	12.5	9.7	5.4	4.1	3.5	3.1	3.2	3.6	4.0	8.6	88.3
Banda	10.3	7.1	8.8	14.5	15.6	20.3	9.7	5.0	5.9	4.4	5.0	9.3	115.9

MEAN NUMBER OF DAYS ON WHICH RAIN FELL.

Place.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
Ternate	14	13	13	17	17	15	10	10	9	10	15	16	159
Bachian	10	12	13	14	15	15	12	15	10	8	11	14	149
Kayeli	16	14	16	15	13	13	10	7	5	5	7	14	135
Amboina	14	14	15	18	22	25	23	22	14	14	11	13	205
Saparua	7	7	8	14	18	22	20	19	12	12	6	9	154
Amahoi	9	9	11	12	15	16	17	19	13	10	8	7	146
Wahai	17	19	16	13	11	10	7	7	6	9	9	14	138
Banda	18	15	17	19	22	21	17	13	10	9	11	17	189

* Selected from "Rainfall of the East India Archipelago," by J. P. Van der Stok, Director of the Batavia Observatory, 1891.

INDEX.

	Page		Page
Abai clump - - -	171	Agutaya island - - -	86
Abak town - - -	350	———, rocks near - -	86
Abatan river - - -	293	Aiduma island - - -	519
Abdon islet - - -	498	Aiton bay - - -	538
Abongabon point - - -	282	Ain (or Yowl) islands - -	499
Abra river - - -	45	—— Baba island - - -	498
—— de Apiton creek - -	266	Ajui bay, river, town - -	266
—— Ito - - -	228	Ajus point - - -	327
—— Vigan - - -	45	Akat islet - - -	457
Abriop bank - - -	379	Akdan mount - - -	242
Abu volcano - - -	412	Akelema point - - -	430
Abulug mountains - - -	365	Aklan point and river - -	258
—— river - - -	365	Alabat harbour; Luzon island -	373
Acha rock; Dumankilas bay -	394	—— island - - -	373
—— shoal; Ragay gulf - -	333	—— point; Samar island -	387
—— Tuning village - - -	516	Alad island - - -	248
Adal island - - -	198	Albay gulf - - -	382
Adam and Eve bank - - -	291	—— river and town - -	383
—— bay - - -	541	—— volcano - - -	383
——, directions - - -	541	Alert patches, caution - -	213
—— head - - -	532	Alexandra bay - - -	516
Adams reef - - -	191	Alibatan islet - - -	234
Adaut reef, beacon - - -	496	Alibijaban island - - -	332
Adder or Culebra island - -	52	Alice channel, tides - - -	181
Adela rock - - -	50	—— reef - - -	181
Adelaide river - - -	542	Aligbay island - - -	320
——, bar, tides - - -	541	——, banks S.E. of - -	320
——, directions - - -	541	Alikan point - - -	121
Adi island - - -	517	Alimpaya point - - -	324
Adolo anchorage - - -	495	Alipayao village - - -	238
Aduar island - - -	485	Allang point - - -	462
Aentopra point - - -	456	Allaru islet - - -	534
Afuera bank - - -	72	Alligator river, East - - -	538
Agayayos point - - -	46	——, South - - -	539
Agbatan point - - -	248	——, West - - -	540
Agio point - - -	224	Alo point - - -	391
Agno point - - -	62	Aloh village - - -	140
—— river - - -	49	Alon-on point - - -	80
—— Grande bay - - -	52	Aloran town - - -	319
Agria point - - -	371	Alpako coal mines - - -	288
Aguada island - - -	349	Alpha shoal - - -	82
—— peak - - -	86	Alto de Flecha hill - - -	395
Aguasa bay - - -	328	Alubijit anchorage - - -	316
Aguirre bank; Kalamianes -	31	Alulayan island - - -	381
——; Salu - - -	115	Alutaya shoal - - -	315
—— port - - -	359	Amagadpayat island - -	308
Aguja peak - - -	171	Amahoi port - - -	461, 574
Agusan river - - -	313	Ambil bank - - -	72

	Page		Page
Ambil island - - - -	72	Aparri anchorage - - - -	365
Ambilon shoal - - - -	131	— light - - - -	365
Ambulan point and anchorage -	275	Apas river - - - -	215
Amblau island - - - -	453	Apaga point - - - -	258
Amboina bay - - - -	462	Apton strait - - - -	266
— — — —, anchorage - - - -	463	Apo East pass; Mindoro strait -	77
— — — —, inner harbour - - - -	464	— island; Negros - - - -	274
— — — — islands - - - -	6, 462	— — — — and reef; Mindoro strait	76
— — — —, North coast - - - -	465	— — — — West pass - - - -	78
— — — —, South and East		Apsley strait - - - -	552
— — — —, coasts - - - -	465	Apud point and shoal - - - -	335
— — — —, products, trade - - - -	7	Arafura sea - - - -	523
— — — —, light - - - -	463	— — — —, currents - - - -	25
— — — —, supplies - - - -	464	— — — —, tides - - - -	525
— — — —, tides - - - -	464	— — — —, winds - - - -	16
— — — —, town - - - -	463	Arago bay - - - -	499
— — — —, weather - - - -	465, 574	Arana rock - - - -	252
Ambolon bank, rock - - - -	76	Arangasa island - - - -	387
— — — — island - - - -	75	Arar Kula islet - - - -	477, 486
Ambong bay - - - -	169	Araru point - - - -	534
Amburayan river - - - -	46	Arayat shoal - - - -	393
Amsterdam island - - - -	510	Archvar shoal - - - -	447
Amurang bay - - - -	426	Arena islet - - - -	335
— — — — gulf - - - -	426	— — — — point - - - -	328
Anahauan point - - - -	231	Arenas point; Luzon S. coast -	226
Anajao point - - - -	380	— — — —; Luzon W. coast -	53
Anajauan island; Negros, W. coast	273	Areta shoal - - - -	81
— — — —; Surigao strait - - - -	309	Arévalo bay and town - - - -	297
Anaayan island - - - -	266	Argao point - - - -	288
Anda island - - - -	411	Argos bank - - - -	254
Andari point - - - -	437	Arguni bay - - - -	518
Ando island - - - -	385	Ariaga island - - - -	411
Andrassy mount - - - -	217	Armadores islet - - - -	411
Andrews point - - - -	542	Armstrong reef - - - -	186
Andulinang islet - - - -	179	Aroroy village - - - -	343
Angas point - - - -	340	Arturito islet - - - -	346
Angosto shoal - - - -	100	Aru islands - - - -	8, 475
Anibayas islands - - - -	330	— — — —, products, trade - - - -	9
Anilao river - - - -	267	— — — —, tides - - - -	477
Anima Sola islet - - - -	336	— — — —, winds and weather -	476
Aniui point - - - -	240	Asia islands - - - -	498
Anitaguipan point - - - -	385	Asia gulf - - - -	255
Annesley point - - - -	526	Aslom islet - - - -	234
Anson bay - - - -	564	Aslum peak - - - -	299
— — — — or Clare reef - - - -	368	Astrolabe bay - - - -	511
Ant cliff - - - -	549	Astuban island - - - -	496
Antiki province - - - -	237	Ati Ati village; Ekka island -	516
Antimonan town - - - -	373	— — — —; New Guinea, W. coast	514
Antoinette mount - - - -	218	Atjeh rock - - - -	169
Antonia islet - - - -	262	Atui island - - - -	455
Anuling island - - - -	89	Aubarede shoal - - - -	252
Aokon island, buoy - - - -	361	Augusta island - - - -	504
Apalit point - - - -	58	Aukwi islet - - - -	308

	Page		Page
Aurora bank - - -	444	Bagunbanua islet; Negros - -	274
Australia, North coast - -	525	Bagupantao point - - -	253
Awa village, anchorage - -	460	Bagut Lapit point - - -	138
Awura cape - - -	519	Bagutayok point - - -	334
Ayam island - - -	505	Bahala island - - -	168
Ayers point - - -	542	Bahia reef - - -	437
Ayninan islet - - -	387	Bahu mount - - -	107
Ayoni bay - - -	327	Baik or Sapei cape - - -	517
		Baimun village - - -	484
		Bain tanjong - - -	481
Baan island - - -	460	Bais islands - - -	275
Babar island - - -	422	Bajapa reef - - -	181
Babatgun anchorage - - -	348	Bakuhan bluff - - -	266
----- point - - -	348	Bakakay island, reefs - -	376
Babi island (or Wolil); Aru islands	482	Bakal point - - -	375
-----; Manipa strait - -	454	Bakan island - - -	355
-----; Serwatti islands -	487	Bakayauan mount - - -	396
-----; Silam harbour - -	190	Bakiki islet - - -	130
----- islet; Aru islands - -	480	Bakkungaan islands - -	166
-----; Gillolo - - -	431	Bako river - - -	230
-----; Great Tawali - -	437	Bakolod town - - -	272
-----; Piru bay - - -	461	Bakor bay - - -	61
Bachian island - - -	435, 574	Bakos islets - - -	231
----- strait - - -	437	Bakuhang island - - -	198
----- town and anchorage -	436	----- islet (East of Silumpat) -	198
Badian island and town; Sebu -	279	----- (West of Silumpat) -	197
----- point; Ragay gulf - -	335	Bakun point - - -	138
Badlay island - - -	345	Balabac island - - -	147
Badok island - - -	43	----- peak - - -	147
Baer island - - -	475	----- strait - - -	147
Bagababoy islet - - -	341	-----, tidal streams -	147, 565
Bagabu island - - -	266	-----, main channel -	147
Bagahak mountain - - -	172, 184	-----, dangers -	148
----- point - - -	184	-----, direc-	
----- range - - -	182	----- tions -	149
Bagaisi island - - -	265	Balabalak island - - -	498
Bagak bay - - -	59	Balabao point - - -	256
Bagakay island - - -	376	Balamban bay - - -	278
----- point; Mindanao -	314	Balambangan island - -	147
-----; Sebu - - -	282	-----, North coast -	150
-----, light - - -	282	Balambing channel - -	133
----- town - - -	382	----- point - - -	133
Bagalayag point - - -	228	----- town - - -	135
Bagamanok port - - -	380	Balanguin point - - -	323
Bagambanua islands - - -	292	Balanguimgue islets; Masbate East	
Baganga bay - - -	389	coast - - -	340
Bagasipal islet - - -	346	Balangungui islands; Sulu -	110
Bagatao island - - -	338	Balangunan roadstead - -	403
Baguala bay - - -	465	Balayan bay and town - -	222
Baguan island - - -	166	Balagan island - - -	261
Bagulayan point - - -	236	Baler bay - - -	371
Bagunbanua islet; Masbate	254	Balesin island - - -	374
		Balete bay - - -	391

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O O

	Page		Page
Balete point - - -	230	Banguet patches, East - -	153
Bali island - - -	441	----- peak - - -	146
Balicastro bay - - -	353	----- South channel - -	153
----- islands - - -	353	-----, dangers - - -	154
----- point - - -	353	-----, directions - -	159
Baliguian islet - - -	265	----- South-east dangers - -	156
-----, shoals near - -	265	Banguet port - - -	364
Balikasag island - - -	293	Bani point - - -	53
Balin island - - -	263	Baulad rocks - - -	283
Balinatog islet - - -	386	Banka island - - -	415
Balingasag bay - - -	815	----- strait - - -	418
Balinhasay cape - - -	52	-----, directions - -	420
Balino town - - -	343	-----, shoals in - - -	419
Baliskan island - - -	374	-----, tidal streams - -	420
Balito river - - -	223	-----, weather - - -	424
Ballena rock - - -	308	Bankawan channel - - -	156
Baloy point - - -	320	----- island; Balabac strait -	153
Balseiro point - - -	112	-----; St. Michael island -	92
Baluk Baluk island - -	108	Bankoka hill - - -	161
Balundangan islet - - -	152	Bankoran island - - -	91
Balung river - - -	214	Bankul bay - - -	263
Balusuan islet - - -	199	Bankulin point - - -	387
Bambagan reef - - -	120	Bankungan island - - -	112
Bambannan island - - -	142	Bankuruan cays - - -	164
Bambu islet - - -	484	Banod or Gazan point - -	331
Banaran island - - -	132	Baños point - - -	403
Banalakan port, or San Andres	328	Bantak island - - -	80
-----, directions - -	329	Bantayan island - - -	275
Banate bay and town - -	267	Bantiki islet - - -	315
Banbayan point - - -	315	----- point; Sorsogon port -	333
Banda harbour, anchorage -	467	-----; Tayabas bay - -	325
-----, directions - -	468	Bantolinnao point - - -	282
-----, supplies - - -	468	-----, light - - -	284
----- islands - - -	7, 466	Banton island - - -	235
-----, products - - -	7	Bantoneillo islet - - -	235
----- reef; Borneo - - -	220	Bantulin point - - -	281
----- rock; Aru islands - -	483	Bao river - - -	299
----- sea - - -	469	Bapdap rock - - -	358
-----, depths and temperature -	469	Baquiao point - - -	259
-----, tides - - -	469	Bara bay - - -	451
-----, winds and weather -	466, 574	----- Sadi reef - - -	495
Banga port - - -	322	Barakan island - - -	484
Bangalao island - - -	110	Baranca Colorada - - -	56
Banganga village - - -	395	Burarin islet - - -	87
Bangaya mountains - - -	399	Baras port; Luzon, East coast -	380
Bangon town - - -	334	----- town; Mindanao, South coast	397
Bangud islet - - -	248	Barcelona port - - -	373
Banguet island - - -	146	Bari island - - -	483
-----, East coast - - -	152	Bariti town - - -	278
-----, North coast - -	151	Barin island - - -	353
-----, South coast - -	154	Barkai island - - -	483
-----, South-east coast -	155	Barlow point - - -	552
----- outer North-east reefs -	152	Barnusa island - - -	494

	Page		Page
Barotak bay and river	267	Batu Kapal; Banka island	416
Barrabas shoal	310	-----; Limbé strait	422
Barrera port	342	----- Mafutiri cape	516
-----, anchorage	343	----- Maudi	109
Barron islet	539	----- Merah	483
Barrow bay	532	----- Puti	516
Baru town	457	----- Sombo island	430
Barugo, anchorage	347	----- tanjong	191
Bas Bas channel	129	----- Tinagat	215
----- island; Pangutarang islands	141	----- point	215
-----; Tawi Tawi	128	----- Wingko islet	413
----- point	119	Batua mount	128
Basiao town	362	Batulaki bay	403
Basiauang bay	401	Baturrapa island	129
Basituli reef	132	-----, dangers near	129
Basilan island	102	Baturua reef	203
----- strait	96	Bauang river	223
-----, shoal	92	----- village	47
-----, winds	98	Bauisa town	115
Basol island	304	Baul islet	386
Basun channel	139	Baun island	484
----- island	137	Baverstock point	112
Batag island	355	Bayan point	189
Batalampon point	324	Bayas isles	264
Batan island	382	Bayatnan island	307
----- port	258	Baybay town	299
Batangapilli islands	503	Beagle reef	537
Batangas bay	223	Beatrice reef	537
-----, anchorage	223	Beaufort reef	204
-----, light	223	Bedford head	532
----- river	223	Bedwell mount	537
Batauan bay	278	Beehive hill	449
Batauanan island	376	Beeston mount	190
Batavia reef	481	Beilan Beilan island	438
Batavier reef	475	Belan point	112
Batbatan island	239	Belang bay	424
Bathurst island	553	Belauan island	109
Bati Laut pulo	199	Bello port	299
----- pulo	199	Belzibub rock	304
Batikara point	441	Benagalet point	223
Batimé island	509	Beng Laut island	412
Bato town; Katanduanes island	379	Bennet bank	252
-----; Leite island	300	Bensbach river	12
Batolaki bank	115	Bentenian islands	423
Batotindok point	324	Beo bay, anchorage	410
Battana island	505	Berkeley bay	531
----- reef	505	Berrugosa point	306
Batu Angus volcano	422	Beta shoal	82
----- Bua	450	Biarro island	415
----- Bolu shoal	107	Biasong point	299
----- Bundita	421	Bizui point	317
----- Chinaga mount	217	Bico river	376
----- Goyang	482	Bihintinusa islet	108

	Page		Page
Bikobian port - - -	369	Blackburne shoals - - -	482
Bikuin point - - -	293	Blackwood shoal - - -	524
Bilaa point, sand-bank - - -	303	Blake reef - - -	189
Bilanbilan anchorage - - -	304	Blanca point - - -	321
Bilanbilangan island - - -	290	Blaze point - - -	564
Bilatan island - - -	132	Blosseville port - - -	502
Biliran channel - - -	347	Blue-mud bay - - -	534
—— island - - -	347	Bluff point; Kasiguran bay - - -	371
Billanguan island - - -	142	———; Mindanao - - -	403
Billeau cay - - -	164	———; Timbu Mata island - - -	199
—— North dangers - - -	164	Bluffs, N.E. and S.W.; Borneo - - -	163
—— South dangers - - -	164	Bo-anan island - - -	165
Bilok Bilok bank - - -	132	Boacoa island - - -	119
Binaar island - - -	477	Boal town - - -	111
Binabasalan islet - - -	386	Boano island - - -	454
Binagon point - - -	249	Boat channel, Darvel bay - - -	188
Binanan islets - - -	266	Boaya point - - -	229
Binanga point - - -	59	Boca Engañosa - - -	337
—— port - - -	59	—— Falsa; port Galera - - -	229
Binangonan mountains - - -	373	—— Grande; port Sorsogon - - -	339
Bingay point - - -	359, 334	Bogo bay - - -	277, 280
Binigian point - - -	273	—— shoal - - -	286
Biniktigan river - - -	58	Bohan island - - -	95
Binlok river - - -	48	Boheian island - - -	203
Binondo, Manila - - -	65	Bohi Dulong island - - -	200
Bintoulan island - - -	126	Bohia cape - - -	519
Bintut islet - - -	95	Bohian island - - -	197
Binuán river - - -	103	Bohol island - - -	290
Binuangan point, anchorage - - -	227	——, islands and reefs north of - - -	291
Binulin river - - -	406	Bojeador cape - - -	42, 364
Binuluangan island - - -	263	——, current off - - -	43, 364
Binuni point - - -	317	——, light - - -	42, 364
Birak town - - -	379	Bokabok island - - -	271
Bird island; Banda sea - - -	470	Bolabok point - - -	249
——; Popham bay - - -	534	Bolai port - - -	404
—— islet; New Guinea - - -	518	Bolinao cape - - -	52
Birds-nest caves - - -	194	—— port - - -	51
Bira island - - -	438	——, directions - - -	51
Bialig bay and town - - -	388	Bolipongpong island - - -	118
Bisaoa point - - -	428	Boljo-on bay and town - - -	289
Bissori bay or Imbu Imbu - - -	436	—— bluff - - -	289
Bisu Bintut island - - -	95	Bolod islands - - -	109
—— Bohan island - - -	95	Bolud point - - -	293
Bisukay island - - -	87	Bombay bank - - -	502
Bitinan island - - -	111	Bombédari islet - - -	501
Bitjoli, or Wassa road - - -	442	Bombon, Cuyo island - - -	86
Bito point - - -	271	—— point; Alad island - - -	248
Biton bay - - -	341	——; Mindanao - - -	319
Black point - - -	531	——; rocky bank near - - -	319
—— rock; Gillolo island - - -	432	Bombonou port - - -	273
——; Paluan bay - - -	73	Bondog head - - -	328
——; Tikao island - - -	342	—— point - - -	328
—— Watch rock - - -	151	Bondulan point, shoal, buoy - - -	242

	Page		Page
Bougao island - - -	134	Bu-a-ning reef - - -	162
——— port - - -	134	Bund island - - -	361
———, tides - - -	134	Buak river and town - - -	331
Bongaya river - - -	167	Bual point - - -	402
Bongo island - - -	398	Buan island - - -	136
Boni harbour - - -	501	——— point - - -	382
———, supplies - - -	501	Buar island - - -	477
———, tides - - -	501	Bubuan island; Sulu - - -	114
Booby island - - -	523	———; Tapiantana - - -	108
Boomboong island - - -	82	———; Tawi Tawi - - -	124
Borak port - - -	80	Buccleugh shoal - - -	501
Borang cape - - -	472	Buchanan islets - - -	553
Borneo - - -	4	Buckingham shoal - - -	294
———, British North - - -	4, 144	Budd islet - - -	498
———, area, population - - -	4	Buena Vista town - - -	242
———, climate, communication 5, 162		Buenabrigo point - - -	278
———, harbours - - -	4	Buffalo mount; Moa island - - -	490
———, produce, trade - - -	4	Buffaloes Horn; Waigia - - -	498
———, North-east coast - - -	162	Bugang river - - -	238
———, directions - - -	170	Bugason town - - -	239
———, rainfall - - -	145	Bugias islet - - -	382
———, monsoons - - -		Baglug islet - - -	265
———, and winds - - -	144	Bagod point and town - - -	281
———, off-lying islands - - -	162	Bagtun island - - -	346
———, temperature - - -	145	Bagui point - - -	253, 342
———, tides - - -	146	———, light - - -	253, 342
Borobodjangan point - - -	353	Bugut port - - -	281
Borongan bay, anchorage - - -	385	———, directions - - -	282
——— town - - -	385	Bugut Lapit point - - -	138
Borope cape - - -	511	Buiong Munti point - - -	59
Botogan point - - -	321	Bujimba mount - - -	128
Botolan mount - - -	55	Bukas islands - - -	308
——— point - - -	55	———, reef, S.E. of - - -	309
Bougainville strait - - -	446, 428	Bakud point - - -	402
Boundary, British and Dutch, Borneo	219	Bukutkut reef - - -	127
Bouru (or Bura) island - - -	450	Bukutua island - - -	109
Bowen strait - - -	526	Bula bay - - -	456
Brace point - - -	550	Bulagao mount - - -	45
Bramble rocks - - -	527	Bulak point - - -	339
Brebes point - - -	510	Bulakau point - - -	260
Bremer port - - -	529	Bulalakao bay - - -	234
——— river - - -	553	Bulalaki point - - -	277
Brenton bay - - -	549	Bulaluan point - - -	402
Breusing peninsula - - -	514	Bulan river and town - - -	339
Brisbane islet - - -	421	Bulangololan point - - -	323
British North Borneo - - -	4, 144	Buli or Wossa bay - - -	441
Britomart shoal - - -	529	Bulicutin islet - - -	111
Brogden point - - -	525	Bulipatuid shoal - - -	204
Broken islands - - -	507	Bulu Bulu islet - - -	180
Bu islands - - -	446	Buluau island - - -	393
		——— lake - - -	402
		Bulubadian island - - -	265
		Bulusan point - - -	400

	Page		Page
Bulusan town and volcano - - -	351	Caballete mount - - -	306
Bum Bum island - - -	204	Caballo island; Manila bay -	61
Bun island - - -	470	-----, light - - -	62
Bunakin island - - -	426	----- point, Basilan strait -	96
Bun-bun island - - -	112	Cabezo de Bondog - - -	328
Bunga point; Mindanao E. coast -	389	----- Tablas peak - - -	236
-----; Sulu - - -	115	Cabra island - - -	71
Bungus point - - -	378	-----, light - - -	71
Bunat point and port - - -	348	Caiman creek; port Essington -	531
Buol town - - -	111	----- point; Dasol bay - -	52
Buoyage, Uniform system, Nether-		----- shoal, beacon; port Sábic -	58
lands East		Calabazas islands - - -	267
Indies - - -	40	-----, light - - -	267
-----, Philippine		Calatrava town, coal seam - -	275
islands - - -	40	Caldera bay, anchorage - - -	26
Burakay island - - -	237	----- point - - -	96, 324
Burankan point - - -	234	Campanario shoal, buoy - - -	285
Burayot point - - -	364	Campbell reef - - -	529
Burford island - - -	538	Campomanes bay - - -	273
Buri island - - -	359	Cañas gulf - - -	267
----- point; Manila bay - -	62	----- islet - - -	263
-----; Masbate - - -	257	Canton packet shoal - - -	444
-----; Ragay gulf - - -	334	Cap island - - -	140
Burias island - - -	335	Cape of Good Hope; New Guinea,	
----- shoal - - -	408	N. coast - - -	511
Burs point - - -	219	Capines point - - -	362, 387
Buru island - - -	6, 450	Capitancillo islet - - -	280
-----, winds - - -	450	Caplap island - - -	509
Buruanga, anchorage - - -	238	Caraballos mountains - - -	42
Burumhan river - - -	385	Carlota rock - - -	235
Burunkan point - - -	76	Carmarines Norte province - -	332
Busainga port - - -	336	Carmelita bank - - -	447
-----, light, tides - - -	337	Carmen bank; Panay, W. coast -	239
Bus-Bus point and river - - -	121	----- shoal; Leite, S.W. coast	291, 300
Bush island - - -	161	Carmencito shoal - - -	263
Busin island - - -	336	Carrasco bank; Sibuyan channel -	253
----- port - - -	336	----- shoal; port Sábic - -	58
-----, anchorage - - -	336	Carrington reefs - - -	155
-----, lights - - -	336	Cartagena bay - - -	273
Busluk point - - -	121	Carteret reef - - -	497
Busson rock - - -	114	Castilla port - - -	309
Busuanga island - - -	78	Castle point - - -	543
-----, East coast - - -	80	Catherine islands - - -	444
Butag bay - - -	340	Cazador point - - -	223
Buton islands - - -	469	Celebes island - - -	5
Button island; Gillolo passage -	445	-----, East coast - - -	423
Buttons islets; Waigiu - - -	422	-----, North coast - - -	424
Butun point - - -	149	-----, North-east coast - -	415
Butuan bay and river - - -	313	Ceram island - - -	6, 454
----- town, supplies - - -	313	-----, North coast - - -	445
Butulan anchorage - - -	403	-----, South coast - - -	460
Buyallao island and point - -	233	-----, West coast - - -	462
Bynoe harbour - - -	563	-----, winds and weather -	454

	Page		Page
Ceram Laut - - -	8, 438	Coal, Manila - - -	68
Cervera rock; Panglao island -	223	—, Sandakan - - -	170
— shoal; Sibugan - - -	252	—, Sebu - - -	285
Chambers bay - - -	540	—, Sual - - -	50
— knoll - - -	179	—, Talisse - - -	417
Chance rock - - -	212	—, Ternate - - -	433
Channel island - - -	557	—, Thursday island - - -	28
— point - - -	564	— mines, Alpako and Uling - - -	288
— rock; Kalupag island - - -	130	—, Batan - - -	382
—, port Darwin - - -	555	—, Baebian - - -	436
Charles Albert archipelago - - -	517	—, Calatrava; Negros - - -	275
— Louis mountains - - -	520	—, Sugot bay - - -	384
— point; port Darwin - - -	555	—, Talabe - - -	275
—, light - - -	555	Claude Hamilton reef - - -	536
— patches - - -	556	Clotilde rock - - -	166
—, Van Diemen gulf - - -	540	Cobrador island - - -	247
Charuk islet - - -	130	Coburg peninsula - - -	529
Cherif islands - - -	394	Cochinos, Los, rocks - - -	62
Chinaman shoals - - -	86	Cockburn, cape - - -	526
Chinela islet - - -	260	—, port; Melville island - - -	551
Chocolate island - - -	276	Cocks inlet - - -	558
Chongos archipelago - - -	135	Coco island - - -	101
Church reef - - -	202	Cocoanut point - - -	449
Churruca shoal - - -	411	Coffin, cape - - -	419
Circe bank; Asid gulf - - -	255	Collas winds - - -	22
—, Mindanao, South coast - - -	393	Collins patch, caution - - -	211
—, Tawi Tawi - - -	132	Colornda point, light; Burias island - - -	336
Clare reef - - -	368	—, Masbate island - - -	342
Clarence strait - - -	545	Commerce, Dutch colonies - - -	40
—, channels - - -	547	—, Philippines - - -	40
—, directions - - -	547	Communication, general - - -	29, 30
—, structure of reefs in - - -	545	—, Amboina - - -	464
—, tides - - -	547	—, Banda sea islands - - -	30
Claude Hamilton reef - - -	536	—, Cuyos islands - - -	87
Climate, Manila - - -	66	—, Dutch colonies - - -	30
—, North-east coast of Borneo - - -	144	—, Iloilo - - -	245
—, Sulu island - - -	110	—, New Guinea - - -	30
Clotilde rock - - -	166	—, North Australia - - -	30
Coal supplies, general - - -	28	—, North Borneo - - -	29, 169
—, Amboina - - -	464	—, Philippine islands - - -	22
—, Babar; Serwatti islands - - -	492	—, Samboanga - - -	97
—, Baebian - - -	436	Concas islet - - -	114
—, Banda - - -	468	Concepcion port and town - - -	235
—, Darwin, port - - -	561	Confusion hill - - -	171
—, Dobbo; Aru islands - - -	479	Connor, mount - - -	214
—, Dorei; New Guinea - - -	28	Constancia rock - - -	315
—, Gisser - - -	458	Cook mount - - -	195
—, Iloilo - - -	245	— reef - - -	549
—, Isabela - - -	104	Copeland islet - - -	526
—, Kema - - -	423	Cora cape - - -	508
—, Koepang; Timor - - -	28	Coral bay - - -	531
—, Kudat - - -	28	— patches - - -	107
—, Labúan - - -	28	— shoal - - -	96

	Page		Page
Cornelis peak - - -	218	Cuyo island, anchorage -	87
Coronada point - - -	322	-----, communication -	87
Corregidor island - - -	61	-----, lights, supplies -	86
-----, light - - -	62	-----, tides - - -	87
-----, tides - - -	63, 565	Cuyos islands - - -	84
Corte mount - - -	290		
Cosme point - - -	341	Daab mount - - -	472
Courier rock - - -	438	Daar island - - -	473
Cowlard islet - - -	527	Dabo Baboli point - - -	441
Crab island - - -	439	Dabun island - - -	361
Creagh reef - - -	204	Daet river - - -	375
Credner mount - - -	515	Dagayan point - - -	232
Crest of Wave shoal - - -	123	Daguet point - - -	389
Cresta de Gallo islet and reef	250	Dagupan, or Sinokalan river	48
Croker island and cape - -	528	-----, anchorage - - -	49
Crook reef - - -	188	-----, harbour light - -	49
Cruz islands - - -	406	-----, pilots - - -	48
----- point - - -	293	-----, railway, telegraph	49
Cuatro isles - - -	300	Dai islet - - -	492
Cucaracha shoal - - -	261	Daijagon bay - - -	277
Cueva point - - -	335, 337	Daisy islet - - -	206
Culebra island; Luzon, N.W. coast	52	Dajikan islands - - -	374
-----; Panay, E. coast -	264	Dakit point - - -	286
-----, shoals eastward of -	264	Dako islet - - -	309
----- islet; Marikaban island	225	Dakula island - - -	394
Cunningham channel - - -	539	Dalaguete point, anchorage	288
Curlew bay - - -	531	Dalipé point - - -	240
Currents, Arafura sea - - -	25	Dalrymple harbour - - -	111
-----, Australia N.W. coast	25	-----, dangers - - -	111
-----, Bachian strait - -	437	Dalumon island - - -	129
-----, Bahia reef - - -	437	Dalupiri island - - -	350
-----, Banda sea - - -	25	Daly port - - -	542
-----, Buru, East coast -	450	Damar cape and mount - -	428
-----, Celebes sea - - -	408	----- islands - - -	431
-----, China sea - - -	24	Damma island - - -	487
-----, Equatorial - - -	22	Damokan islet - - -	118
-----, counter - - -	23	Dampier island - - -	511
-----, South - - -	24	----- strait - - -	503
-----, Gillolo, West coast	438	-----, directions - - -	505
-----, Japan stream - - -	23	-----, tides, winds - -	503
-----, Luzon, North coast	364	Danajon bank - - -	290
-----, Mindanao, East coast	391	Danao river; Negros, E. coast	274
-----, North coast - - -	322	-----; Sebu, E. coast -	281
-----, Molucca passage - 25, 434, 428		----- town - - -	282
-----, Manusa islands - -	409	Danaodanauan island - - -	305
-----, New Guinea, N.W. coast	511	Danawan island - - -	209
-----, Rossel - - -	24	Danger point; Bowen strait	533
-----, San Agustin cape - 391, 408		-----; port Bremer -	529
-----, Sebu sea - - -	226	Danjungan island - - -	273
-----, Sulu sea - - -	25, 83	Dao town - - -	240
-----, Vashon head - - -	533	Dapa channel and reef - -	310
Cust reef - - -	210	Dapdap point; Guimaras island	241
Cuyo island - - -	86	-----; Sebu, E. coast -	282

	Page		Page
Dapitan bay - - -	320	Delconte point - - -	207
———, light - - -	320	Delfzyl island - - -	308
——— river and town - - -	321	Delian island - - -	81
Daraga town - - -	257	Dent haven - - -	175
Darajuay islands - - -	360	———, anchorage - - -	175
Daram island; Misol island - - -	449	———, banks - - -	175
———; New Guinea, W. coast - - -	513	———, directions - - -	176
———; Samar, W. coast - - -	361	———, tides - - -	176
Darby bank - - -	213	Deoto Bata island - - -	141
Darch isle - - -	526	Desenda point - - -	371
Darigayos bank - - -	46	Destacado island - - -	349
——— point, town - - -	46	Dewhurst bay - - -	172
Darsena island - - -	349	Dialao point - - -	364
Darvel bay - - -	181	Diamante rock - - -	350
———, aspect - - -	183	Diangappik point - - -	112
———, tidal streams - - -	183	Dibatuk island - - -	80
———, winds and weather - - -	182	Dibayabay point - - -	371
——— peninsula - - -	185	Dichilem or North-west rock - - -	79
Darwin port - - -	554	Didikas rocks - - -	368
———, anchorage - - -	558	Dieke point - - -	430
———, dangers - - -	555	Dikalingan peak - - -	400
———, directions - - -	559	Dikapinisan point and islet - - -	371
———, jetties - - -	558	Dilasak bay or Tumango - - -	370
———, landmarks - - -	554	Dile point - - -	45
———, lights - - -	555, 556, 559	Dimalansan port - - -	369
———, Palmerston town - - -	561	Dimiao town - - -	224
———, pilots - - -	560	Dimipak, or High island - - -	79
———, quarantine - - -	560	Dinagat island - - -	305
———, supplies, coal - - -	561	———, West coast - - -	305
———, telegraph cables - - -	558	——— town - - -	305
———, tides - - -	560	Dinapiki point - - -	362
———, weather - - -	562	Dinaran island - - -	80
Dasol bay - - -	52	Dinas port - - -	396
Dassalan island - - -	106	Dingala bay - - -	371
Datinuanua point - - -	331	Dio islet - - -	363
Datu reef - - -	475	Dipulut islets - - -	109
Dauan island - - -	105	Dirikwi creek - - -	43
Dauigan point - - -	321	Discovery bank - - -	77
Dauin point - - -	274	Distoring point and islet - - -	371
Dauit point - - -	321	Dit island - - -	85
Dauli point - - -	53	Diualan point - - -	318
Davao gulf - - -	405	Djuata point - - -	314
——— town and river - - -	405	Divatuv river - - -	193
———, anchorage - - -	405	Divilakan bay - - -	368
———, tides - - -	406, 569	Divinubo island - - -	385
Dawalur islet - - -	492	Djalo island - - -	430
Dawera islet - - -	492	Doan point - - -	473
Dawson rock - - -	198	Docks - - -	28
Dayagan point - - -	232	Dockyard, Kavite - - -	28
Dayana island - - -	394	Dobbo harbour - - -	479
De Courcy head - - -	525	———, coal and supplies - - -	479
Deagan island - - -	345	———, direction - - -	480
del Monte point - - -	228	———, pilots - - -	480

	Page		Page
Dobbo harbour, tides -	480	Dundas strait, tidal streams -	536
Dodinga bay, town, anchorage -	429	Duperrey port -	499
Dok-kan island, anchorage -	141	Dupon port -	298
Dolphins Nose peninsula -	500	Dupulisan point -	397
Dom islet -	510	D'Urville point; Raffles bay -	529
Dominga shoal -	76	—— port; Waigiui island -	499
Don cape -	535	Dusborgh reef -	488
—— islands -	276	Dutch colonies, commerce -	40
Donauang island -	401	—— spit -	220
—— shoals -	401	Dyo island -	502
Dondonay island -	89		
Dong Dong island -	118	East Alligator river -	538
Dongan bay and point -	74	—— arm; port Darwin -	556
Donjon rock and reef -	75	—— Banguet patches -	153
Donsol river and town -	338	—— bay; port Essington -	532
Dorei bay -	12, 28	—— Gubuan islet -	182
Dorlau island -	485	—— harbour; Selé strait -	509
Des Amigos port -	139	—— hill; Banguet island -	146
—— Hermanas islets -	235	—— Nonokong island -	220
Double hill -	207	—— point; port Darwin -	555
Douquay Trouin shoal -	368	——; Sibetik island -	219
Dourga strait -	522	—— Veruon island -	546
——, tides -	522	Efibe island and anchorage -	449
Dowora island -	431	Egbert shoal -	363
Dranan islet -	475	Egeria rocks -	160
Dramai island -	519	—— shoal -	219
Driftwood point -	172	Egeron strait -	425
Dromedary mount -	128	Eka island -	516
Dry bank; Maibun bay -	116	El Fraile rock -	60
Du Roa strait -	475	Elcano shoal -	260
Dabus haven -	518	Elephant islet -	320
Dugolaan point -	397	Eli town; Ké islands -	8
Dula town -	8	Ellat village -	472
Dulan-Laut island -	475	Elopura town -	169
Dulang Dulang rocks -	133	Elpaputi bay -	460
Dulanguin point -	323	Elphinstone reef -	512
Duljo point -	293	Emery point -	556
Duljugan point -	298	——, light -	556
Dumaguete point -	274	Encanto point -	371
Dumalag island -	405	End hill; Darvel bay -	184
Dumali point -	283	Ender rock -	475
Dumalin point -	324	Endyagout island -	538
Dumangas point and river; Iloilo		Engaño cape; Luzon, N. coast -	366
strait -	267	——, light -	366
—— river; Dingala bay -	371	—— mouth, light; Burias island -	337
Dumanjok point -	279	Engañosa mount -	335
Dumankilas bay -	394	—— opening -	337
—— point and river -	325	England island -	442
Dumaquit point, shoal -	338	English or Selé point -	508
Dumunpalit island -	79	—— spit -	215
Dumarug point -	345	Ennu island -	488
Dunao islet -	265	Entrance peninsular -	514
Dundas strait -	585	Er island -	473

	Page		Page
Ermita observatory - - -	68	Fisher island - - -	505
Erzherzog reef - - -	212	Fitzmaurice shoal - - -	449
Escape cliff - - -	540	Five islands - - -	431
Escarceo point - - -	222	Five-fathoms patch - - -	546
Escarpada island; San Bernardino		Flaca point - - -	390
strait - - -	349	Flag hill - - -	555
— point; Luzon, N.E. coast	368	Flat hill; Labuk bay - - -	167
Esconchada point - - -	305	; Trangan island - - -	481
Escucha islet - - -	366	Flecha peninsula - - -	395
Eseo bank - - -	112	point - - -	395
España river - - -	249	Fleeming cape - - -	549
shoal - - -	340	Flinders shoal - - -	524
Espíritu Santo cape - - -	384	Florentia islet - - -	498
Esplee island, anchorage - - -	447	Fly river - - -	12
Essel island - - -	447	rock - - -	161
Essington, port - - -	529	—, clearing mark - - -	161
—, directions - - -	533	Flying Fish rock - - -	165
—, inner harbour - - -	532	Foelsche bank - - -	544
—, tides - - -	533	Fog bay - - -	564
Estancia anchorage - - -	264	Fogi town - - -	451
Etna bay - - -	520	Forrest, cape - - -	499
Eto anchorage - - -	491	Fort hill; port Darwin - - -	556
Evanas point - - -	505	point; Iloilo - - -	241
Evans island - - -	173	Fortune island - - -	69
shoal, caution - - -	524	Foul island - - -	505
Ewaf islands - - -	471	Fourcroy cape - - -	554
Exit island - - -	509	—, shoals near - - -	554
Eye island - - -	446	Fow island - - -	445
		Framjee bank - - -	81
Fadoh island - - -	471	Frances bay - - -	556
Fagg reef - - -	47	reef - - -	180
Fair island - - -	474	Franklin shoal - - -	524
Fairway shoal - - -	159	Frederick Henry island - - -	522
Fak Fak anchorage - - -	516	Freemantle shoal - - -	202
village - - -	516	Freshwater bay - - -	516
False cape; New Guinea, N. coast -	511	Freycinet cape - - -	500
— Pisang island - - - S.W. point	523	Friedrich haven - - -	214
— Pisangs - - -	513	—, directions - - -	214, 218
Fanny bay - - -	556	—, tides - - -	214
Farewell island - - -	443	reef - - -	212
Farulei village - - -	479	Fright point - - -	544
Fatimo islands - - -	395	Fuego point - - -	69
Fatujuring point - - -	480		
Favorite bank - - -	107	Gabo port - - -	306
Feer anchorage - - -	472	Gafi islet - - -	435
Fenjurin island - - -	483	Gag island - - -	446
Fernandez point - - -	235	Gaia pulo - - -	200
Field islet - - -	539	—, anchorage, water - - -	201
Finke bay - - -	540	reef - - -	201
First Passage island - - -	508	Gajo point - - -	383
Fish reef - - -	562	Galela bay and town - - -	441

	Page		Page
Galera point - - - -	321	Gigoso point - - - -	386
—— port - - - -	228	Gijalo bay, village - - -	380
——, anchorage, directions -	229	Gillolo island - - - -	5, 428
Gales - - - -	22	——, East coast - - -	441
Galewo islet - - - -	507	——, West coast - - -	428
Gallo Mallo channel - - -	132	—— passage - - - -	440
Galvaney point and islets -	334	——, dangers North of -	444
Gam Sungi road - - - -	443	——, dangers in South	
Gambier cape - - - -	545, 548	part of - - - -	447
Gamen island - - - -	509	Gilutugan islet - - - -	256
—— strait - - - -	503	Gimia road - - - -	443
Gamyaka reef - - - -	437	Gipdo island - - - -	305
Gan bay - - - -	43	—— passage - - - -	305
Ganc road - - - -	431	Gisser island - - - -	458
Ganeh island - - - -	431	——, anchorage, directions -	458
Ganga island - - - -	417	——, reefs, beacons - -	458
Ganon town - - - -	118	——, tides - - - -	459
Garden point - - - -	551	Glan river, light - - -	402
Gareel shoal - - - -	442	Glyde point - - - -	544
Garnusa reef - - - -	494	Godan island - - - -	473
Garza island - - - -	76	Gogo point - - - -	263
Gasé channels - - - -	448	Goitya shoal - - - -	111
—— island - - - -	448	Golo island - - - -	73
——, shoal near - - - -	448	Gomo Gomo village - - -	484
Gaspar island - - - -	331	Gomono island - - - -	438
Gatabang islet - - - -	198	Gondol island - - - -	131
Gatbo village, coal at - -	384	Gono islets - - - -	459
Gato island; Masbate, W. coast	253	Goram islands - - - -	459
—— islet; Sebu island - -	257	——, pilots - - - -	459
Gay island - - - -	368	Gorda head; Mindanao, W. coast	322
Gaya bay - - - -	169	—— point; Mindanao, E. coast	390
—— harbour - - - -	4	——; Mindanao, N. coast -	315
Gazan point and town - -	331	——; Ragay gulf - - -	333
Gazelle harbour - - - -	515	——; Sebu, W. coast - -	278
Gebi island - - - -	445	Gordon bay - - - -	553
Geelvink bay - - - -	511	Gorrion islet - - - -	337
Gelatiok river - - - -	339	Gosai islet - - - -	460
Gelanit hill - - - -	474	Govenen island, Great - -	105
Gem reef - - - -	174	——, Little - - - -	105
Gemok mountain - - - -	217	Gran Laja islet - - - -	366
General island - - - -	308	Grande island; port Súbic	57
—— remarks - - - -	1	Grant island - - - -	527
Gerama island - - - -	409	Grassy point - - - -	129
German town; Sandakan harbour	169	Gray reef - - - -	187
Germania point - - - -	12	Great Banda island - - -	467
Gibuson island - - - -	306	—— bank of Santa Cruz; Basilan	
Gide island - - - -	516	strait - - - -	92
Gieta bay - - - -	430	—— Govenen island - - -	105
Giffard islet - - - -	191	—— Johns island - - -	509
Gigantangan island - - -	297	—— Kalupag island - - -	130
Gigantes islands - - - -	262	—— Kanari island - - -	449
——, bank E.N.E. of - - -	263	—— Kapones island - - -	56
——, light - - - -	262	——, light - - - -	56

	Page		Page
Great Karaweira island - - -	485	Gunong Api island ; Banda sea -	470
— Ké island - - -	472	— Batu Angus volcano -	422
— Santa Cruz island - - -	22	— Sudara volcano -	422
— Tawali island - - -	436	— Sudi anchorage -	462
Green islet - - -	24	Guuripingi village - - -	434
Greenhill island - - -	538	Guntuan islands - - -	307
— point - - -	300	— passage - - -	307
Greyhound strait - - -	439	—, directions - - -	312
Griffin reef ; Serwatti islands -	488	—, pilots - - -	307
— rocks ; Sulu archipelago -	106	Gusong islet - - -	167
Grose islet - - -	563	— di laut - - -	191
Grosvenor bank ; Bu island -	447	Gusun bank - - -	120
— reef ; Waigiu - - -	502	Gusungan islet - - -	207
Guai bay - - -	52		
— point - - -	55		
Gual point - - -	403		
Guangan peninsula - - -	390	Haja point - - -	462
Guarichi islands - - -	435	Halcon mount - - -	73
Gubat harbour - - -	351	— rock, or Wilhelmina reef -	108
—, pilots - - -	351	Halloran reef, clearing mark -	188
Gubbins rock - - -	167	Halmaheira island - - -	428
Guhuan islet, East - - -	152	Hambly reef - - -	192
—, North - - -	151	Hamoraruan bank - - -	348
Guijulugan town and river -	275	Hand rock - - -	213
Guilbay point - - -	334	Hardy patch - - -	175
Guimaras island - - -	242	Hare's ears islands - - -	106
—, light - - -	243	Harris isle ; port Cockburn -	551
— strait - - -	243	— reef ; Clarence strait -	547
Guimugahan point - - -	271	Hart point - - -	542
Guisamban point - - -	381	Haruku island - - -	465
Guinapak rocks - - -	368	Hasil island - - -	431
Guinauyan islet - - -	257	Hastings point - - -	193
Guinayan town - - -	333	Hatling bay - - -	456
Guinduianan point - - -	337	Hatton mount - - -	172
Guindulman bay and town -	294	Havik reef - - -	506, 510
Guinjang islet - - -	309	Haycock bank - - -	411
Guinlabagan islet - - -	236	— island ; Manila bay -	62
Guinlabo islets - - -	86	— islands ; Karkaralong is-	
Guintakan island - - -	276	— lands - - -	411
Guion town - - -	257	Heel reef - - -	212
Guian peninsula - - -	385	Hegad island - - -	114
— town - - -	385	Helen reef - - -	427
—, anchorage - - -	386	Helvetius cape - - -	554
Guianon islet - - -	244	Hennekes point - - -	431
Gujangan island - - -	112	Henry Ellis reef, beacon -	546
—, rock N.E. of - - -	112	Herberg strait - - -	437
Gulisaan - - -	166	Herile village - - -	492
Gull rock - - -	432	Hermana islands ; Luzon, W. coast	52
Gumalak island - - -	228	Hermanos islets ; Luzon, N. coast	366
Gunatin island - - -	414	Hesketh shoal - - -	512
Gunn point - - -	544	Hewett mount - - -	195
Gunong Api ; Banda island -	467	Hieri island - - -	433
— ; Siau island - - -	414	Higan town - - -	118

	Page		Page
High island, or Dimipak	79	Ilampulugan island	272
— peak; Gomono island	418	Ildefonso, cape San	370
—; Luzon, W. coast	55	Iligan bay; Mindanao, N. coast	316
— point; Raffles bay	529	— point; Luzon, N.E. coast	368
Hijo river and town	407	— river and town	316
Hila village	465	—, telegraph	316
Hill islet	499	Ilijan point	226
Himamaylon river	272	Ilin island	75
Himukitan island	290, 300	— mount	75
Hinatuan town	388	— spit	75
Hinondayan bay	302	— town, anchorage, supplies	75
Hinunangan bay	302	Illana bay	396
Hirapsan islet	354	Ilocas mountains	47
Hitongos town	299	Iloilo, anchorage	246
Hitu peninsula; Amboina island	462	—, coal, supplies	245
Hog point	175	—, communication, telegraph	245
Holmes rock	192	—, directions	241, 270
Honden or Dog island	487	—, lights, town	244
Hood hill	206	—, pilots	245
Hooper mount	539	—, river	245
Hope inlet	544	—, strait	240, 268
Horadaba islets	378	—, directions-	241, 270
Horn rock	324	—, lights	243
Hotham cape	540	—, south approach, buoys	241
Howard channel	547	—, tides	268
— knoll	540	—, tides	246, 566
— shoal	185	—, trade	244
Hoya bay and point	460	Ilwaki road	486
Hu point	457	Imalaguan islet	88
Huiberg bank	411	Imaruan islet	85
Huidobro reef	401	Imbu Imbu	436
Huisman rock	471	Inaguikan point	372
Hull rock	175	Inampulugan island	243
Hump island	504	Indagamy islet	87
Hundred isles	51	Indang point	375
Hunter bank; Siang island	446	Indian island	563
— rock; Mindoro strait	78	Indus reef	525
Hurd mount	554	Ine islets	446
— port	553	Inga island	459
Hurricanes	20	Initao bay and town	316
		— point	316
Iba mount	55	Inog bay	402
— point, telegraph	55	Intercourse river	552
— river, anchorage off	55	Interview point	552
Ibahay point	259	Iot point	378
Igan bay	243	Ipa village	440
Igasan point	112	Iphigenia rocks	411
Igat bay and island	395	Ipil point	251
Ignesui cape	511	Iriga mount	381
Iguana bank	268	Irimon bay	74
Ilaakon islet	272	Iris or Saraweri strait	519
		Isabel rock	235
		Isabela port	103

	Page		Page
Isabela port, coal - - -	104	Jintotolo channel - - -	260
———, directions - - -	103	——— to Sebu, directions	286
———, tidal signals - - -	105	——— island - - -	255
———, tides - - -	105, 569	———, landmark - - -	255
Isarog mount - - -	381	——— point - - -	255
Isidro bay and town - - -	297	Jiwata lake - - -	93
Ivantakut island - - -	361	Jobo point - - -	387
Iyoi island - - -	445	Johnston rock - - -	166
		Jomalig island - - -	374
Jacquinet bay - - -	500	Joji islet - - -	430
Jagna town - - -	294	Juak island - - -	349
Jahleel point - - -	542	Juban bay - - -	350
Jakati river - - -	515	Judei island - - -	483
Jalian island - - -	310	Jurao-Jurao islet - - -	240
Jaligui river - - -	278	Jursian islands - - -	485
Jaljat hill - - -	242		
James patch - - -	180	Kabahan islet - - -	237
Jambongan islands - - -	162	Kabakan point - - -	406
Jambuai island - - -	484	Kabakian islet - - -	305
Jamelo port - - -	69	Kabalarian islet - - -	386
Jamuraon bay - - -	334	Kabalata peak - - -	400
Janabatas channel - - -	361	Kabaletc island - - -	374
———, light - - -	361	Kabalian mount - - -	309
Jandayan anchorage - - -	292	——— point; Sulu island	116
Jaro town - - -	244	———, light; Tablas island	236
Jasaan town - - -	315	Kabalik point - - -	242
Jau island - - -	291	Kabalion point, light - - -	236
Jaudin island - - -	483	Kabalitian island - - -	51
Java reef; Aru islands - - -	478	Kabalusu island - - -	411
———; Sulu sea - - -	92	Kaban islet - - -	224
Jedan islet - - -	477	Kabangan point, reef; port Súbic	58
Jef-doi islands - - -	446	——— town - - -	56
Jef-fam or Tameai islands - - -	503	Kabankauan island - - -	137
Jei island - - -	482	Kabarei bay - - -	500
———, tides - - -	482	Kabarruyan island - - -	51
Jeronga island - - -	431	Kabaun island - - -	353
Jeschke (Jakati) river - - -	515	Kabgan island - - -	307
Jessie Beazley reef - - -	91	Kabiai gulf - - -	502
——— shoal - - -	148	Kabilan islets - - -	305
Jesus point; Luzon, E. coast - - -	383	Kabilao island - - -	292
———; Samar, W. coast - - -	360	Kabingnan island - - -	119
Jibatan point and river - - -	358	Kablagna point, shoal - - -	387
Jibitnil island - - -	277	Kobobolol or Selé strait - - -	507
Jilaitan point - - -	275	Kabra island - - -	509
Jilantaguan islets - - -	276	Kabsugan island - - -	307
Jimenez town, anchorage - - -	318	Kabug point - - -	255
Jimuguit river - - -	281	Kabugan islands - - -	302
Jin islands - - -	484	Kabugao anchorage and river;	
Jinamok island - - -	363	——— Luzon, W. coast - - -	44
Jinatungan point - - -	303	——— bay and river; Katan-	
Jindan point - - -	375	——— duanes island - - -	379
		——— point; Iloilo strait - - -	242

	Page		Page
Kabukan island - - -	114	Kalaitan channel - - -	131
Kabulig bay, anchorage - -	315	Kalaklan point, beacon - -	57
Kabulauau islands - - -	82	———, river - - -	58
Kaburuan island - - -	410	Kalam village - - -	430
Kabusao river - - -	323	Kalama island - - -	413
Kabuyok point - - -	330	Kalamianes islands - - -	78
Kadburauan or Panganir point -	335	———, bank north of -	79
Kadmon town - - -	281	———, shoals east and	
Kadodiangan point - - -	249	S.E. of - - -	81
Kaduayan town - - -	112	Kalampunian island - - -	152
Kaduruan point - - -	257, 345	Kalanguan cay - - -	163
Kaffra cape - - -	517	Kalangaman islet - - -	281, 298
Kagayan islands and reefs - -	89	Kalanhalangan channel - - -	120
——— river; Luzon, N. coast -	365	Kalanhayaan island - - -	80
———, anchorage - - -	366	Kalantas bank - - -	348
———, bar - - -	365	———, tides - - -	349
———, light - - -	365	Kalapa island; Sawai harbour -	455
———, pilots - - -	366	——— islets; Serwatti islands -	421
———, tides - - -	366	——— point; Celebes, N. coast -	426
———; Mindanso, N. coast -	316	Kalapan bay and town; Mindoro -	230
———, anchorage, telegraph cable -	316	——— islet; port Palapa - -	354
——— Sulu islands - - -	93	——— point or Tibao - - -	231
———, anchorages - - -	94	Kalape island and port; Bohol -	292
———, tides - - -	94	Kalatayan point - - -	69
Kagayancillo island - - -	89	Kalaton point - - -	236
Kagbalsay island - - -	375	Kalavite cape - - -	73, 227
Kagdullon islands - - -	359	——— mount - - -	227
Kaguan point - - -	58	Kalbayok anchorage - - -	358
Kahamkamman islet - - -	152	———, lights - - -	358
Kahayagan island - - -	354	Kalian point - - -	403
Kaibobo road - - -	461	Kalianan rock - - -	387
Kaidos island - - -	470	Kalibon point - - -	396
Kailakat anchorage - - -	452	Kalinaon islet - - -	421
Kaima bay - - -	334	Kalingangin point - - -	412
Kaimana bay - - -	518	Kalintan island - - -	349
Kaimeer island - - -	470	Kalis point - - -	81
Kain Kain Beba - - -	511	Kaloag town - - -	46
Kajidiokan point - - -	250	Kalolbong town - - -	379
Kajogau island - - -	354	Kalomatan river - - -	355
Kaju Mera island and bay -	512	Kaltagan island - - -	361
Kakarutan islet - - -	402	Kalublu island - - -	106
Kakataan island - - -	124	Kalumpun peninsula; Luzon, S.W.	
———, anchorage - - -	127	coast - - -	223
Kakraray island - - -	382	——— point, semaphore; Manila	
Kaku Siel mountain - - -	450	bay - - -	60
Kakub port - - -	310	——— river - - -	224
Kalaba islet - - -	326	Kalunangan point - - -	299
Kalabakang river - - -	216	Kalung Kalungan islet - - -	121
Kalaboso point - - -	222	Kalupag islands - - -	130
Kalaguan island - - -	263	Kalusa island - - -	20
Kalaguas islands - - -	374	Kalut island - - -	103
Kalailayan town - - -	327	Kaluya island - - -	234
		Kamagon anchorage - - -	373

	Page		Page
Kamalian point - - -	403	Kantilan village - - -	307
Kamandak island - - -	346	Kantingao point - - -	249
Kamanga islets - - -	79	Kanton island - - -	373
Kamasusu islet - - -	255	Kapal island - - -	467
Kamba channel - - -	131	Kapalai islet and reef - - -	210
Kambalot shoal - - -	360	Kapale pulo - - -	208
Kambasag point - - -	310	Kapaluan bay - - -	326
Kambasingan islet - - -	386	Kapsu bay - - -	517
Kambidsos rocks - - -	359	—— district - - -	516
Kamboling islet - - -	411	Kapia district - - -	520
Kamboloton bluff - - -	263	Kapiboi village - - -	502
Kambulayan point and river - - -	250	Kapiz river and town - - -	259
Kambulong point - - -	394	—— road - - -	259
Kamigin island; Mindanao, N. coast - - -	314	Kapnoyan islet - - -	88
——, volcano - - -	315	Kapones islands - - -	56
——; Luzon, N. coast - - -	368	——, light - - -	56
Kamoropudan islet - - -	363	—— point - - -	56
Kamotes islands - - -	299	Kapual island; Sulu archipelago - - -	111
Kampong point - - -	507	Kapul island; San Bernardino strait - - -	350
Kampopo bay - - -	298	——, light - - -	350
Kampukan peak - - -	239	Kapuluan point - - -	323
Kamrau (or Arguni) bay - - -	518	Kapuntakan hill - - -	383
——, shoals - - -	518	Kapunuyugan point - - -	308
Kanaçao bay - - -	61	Karabao island; Panay, N. coast - - -	237
Kanaguan islands - - -	377	—— islet, Manila bay - - -	60
Kanaguayan port; Samar - - -	352	Karabuka point - - -	395
Kanahauan dako - - -	359	Karaga bay - - -	389
—— islands - - -	359	Karakelang island - - -	409
Kanaibon point - - -	385	Karakitang islands - - -	413
Kanalasan cove, anchorage - - -	402	Karamuan port - - -	377
——, light - - -	402	Karang island - - -	483
Kanamay point - - -	275	—— Karang village - - -	111
Kananay island, light - - -	361	—— Tamlan, reef - - -	460
Kanari islands - - -	442	Karangdato point - - -	117
Kanaron island - - -	82	Karamisan point - - -	74
Kanaunayan point - - -	298	Karao bay - - -	379
Kananayor islet - - -	314	Karas Kani island - - -	517
Kandaya poin - - -	277	—— reef - - -	517
Kandogos reef - - -	359	Karaton island - - -	409
Kaudon point - - -	46	Karawata islet - - -	518
Kangouak point - - -	251	Karaweira islands - - -	485
Kanigao island - - -	290	Karbau mount - - -	490
Kanimo island - - -	375	Karbu point - - -	451
Kaninoan islet - - -	386	Karigara town - - -	347
Kanipan bank - - -	401	Karkar bay and point - - -	288
Kanipo island - - -	87	Karkaralong islands - - -	411
Kankabato bay and port - - -	362	Karkeli point - - -	479
Kankuman islet - - -	108	Karmen port - - -	281
Kanmamot island - - -	359	Karnasa island - - -	257
Kanmanok hills - - -	293	Karogo islet - - -	254
Kanoan port - - -	295	Karongdong town - - -	118
Kantilan reef - - -	308	Karslake islet - - -	549
		Karufa river - - -	518

	Page		Page
Kasa islet	461	Kayeli bay, directions -	452
Kasamayan bank	260	———, supplies	453
Kasapaan shoal	131	———, town, rainfall	452, 534
Kasiem island	509	Kayoa island	434
——— road	449	Kayu bay, town, and river	441
Kasiguran bay	370	Kè Dulan harbour	474
Kasilaran bay	405	———, supplies	474
Kasiwui island	459	——— island	473
Kasulian islet	309	——— town and anchorage	474
Katabanga bay and river	334	—, Grent, island	472
Katadman anchorage; Samar	353	— islands	8, 471
——— point; Sebu	281	— Tanimbar island	473
Kataingan port	346	Kebang Kele point	502
———, anchorage	345	Kechil rock	165
Kataisan point	362	Keffing islands	437
Katanauan bay	327	——— strait	457
Katanduanes island	378	Keith cape	536, 549
Katarman anchorage; Kamiguin		———, patches near	536
——— anchorage	314	Kelang island and strait	454
——— point; Mindanao, E. coast	388	Keliwala islets	518
Katbalogan bay and town	359	Kema anchorage, supplies	423
———, light	360	Kennedy bay; Borneo, N.E. coast	185
———, telegraph cable	360	———; port Esington	531
Katbatan point	343	Kestrel rock; Balábae strait	149
Kateal town	275	——— shoal; Mallawallé channel	165
Katel river	388	Kidamak bay	398
Katinai islet	431	Kidan island	458
Katingas point	249	Kiddle reefs	194
Katumi island	517	Kidipil point	400
Katundulan point	337	Kikik island	448
Kauanhahau point	335	Kiko shoal	310
Kaueli island	90	Kilwaru islet	8, 458
Kauit bay, anchorage; Mindanao,		Kima island	413
W. coast	323	Kiminatin islands	88
——— mount; Luzon island	43	Kinabakbagan reef	55
——— point; Marinduque island	331	Kinabatangan hills	171
———; Mindanao, E. coast	308, 387	——— river	172
———, W. coast	323	———, bar	172
———; Sebu port	285	Kinablagan point	389
———, W. coast	277	Kinaobohutan island	416
———; Sibuyan island	249	Kinalang road	316
Kauitan point	273	Kinalasag island	376
Kaukaue point	63	——— (Laja) rock	377
Kaulungan island	106	Kinamaligan island	353
Kaville island	90	Kinamanokan island	375
Kavite harbour	61	Kinapuran group; Sulu archipelago	126
———, light	63	Kinapusan island; Kagayan Sulu	94
———, patent slip, &c.	61	King William island	504
———, port limits	61	King's cove	552
———, tides	567	——— table hill	555
Kawio islet	411	Kini Balu mountain	4
Kayeli bay	451	Kiniluban isles	85
———, anchorage	452	Kiuituai shoal	360

	Page		Page
Kipit point - - - - -	321	Kuby point, buoy - - - - -	57
----- river - - - - -	321	Kudat harbour - - - - -	4, 169
Kiruru bay - - - - -	520	-----, coal - - - - -	28
Kisa Laut anchorage - - - - -	460	Kukuban cay - - - - -	163
Kissa island - - - - -	482	Kukusan mount - - - - -	217
Kissing hill - - - - -	191	Kulasi bay; Panay, S.E. coast - - - - -	267
Klaarbeek island - - - - -	446	-----; San Bernardino strait - - - - -	349
Klobat volcano - - - - -	422	----- point - - - - -	348
Knight reef - - - - -	546	Kulassun island - - - - -	139
Knocker bay - - - - -	532	Kulewatti bay - - - - -	487
Koba island - - - - -	480	Kuli Babang inlet - - - - -	205
----- Sungi - - - - -	480	Kulili point - - - - -	43
Kobi bay - - - - -	436	Kulion island - - - - -	87
Kobur island - - - - -	480	Kultubai islets - - - - -	484
Kobton bay - - - - -	294	Kulur; Aru islands - - - - -	477
Koepang; Timor - - - - -	28	----- anchorage; Sangir island - - - - -	418
Kofiau island - - - - -	447	Kumalarang creek; Mindanao, S. - - - - -	395
Kokaguayan point - - - - -	273	----- coast - - - - -	104
Kokonongon point - - - - -	80	----- river; Basilan island - - - - -	517
Kokoro islet - - - - -	87	Kumawa peninsula - - - - -	207
Kola island - - - - -	477	Kumpang Kumpang island - - - - -	208
-----Watu - - - - -	477	----- river - - - - -	485
Kolasi point and town; Luzon, E. coast - - - - -	275	Kumul island - - - - -	141
-----; Sebu, W. coast - - - - -	279	Kunilan island - - - - -	407
----- town; Panay, W. coast - - - - -	239	Kupiat island - - - - -	470
Kolff bank - - - - -	522	Kur island - - - - -	460
Kolokonto bay - - - - -	325	Kurkap island - - - - -	43
Kolokoto rock - - - - -	79	Kurrimao port - - - - -	338
Komas island - - - - -	51	Kutkut point, rock - - - - -	62
Kommerrust island - - - - -	446	La Monja rock - - - - -	133
Kon islets - - - - -	459	Laa island - - - - -	135
Konan islet - - - - -	477, 486	-----, supplies - - - - -	487
Konibar islet - - - - -	498	Laag island - - - - -	447
Konloai point - - - - -	231	Laat bay - - - - -	317
Konsumala point - - - - -	251	Labo point - - - - -	436
Kopton mount; Bohol island - - - - -	290	Laboa mount - - - - -	5, 28, 169
----- point; Sebu island - - - - -	279	Labuan - - - - -	451
Kora Kora inlet - - - - -	418	----- Kora Kora, anchorage - - - - -	151
Koroan point - - - - -	392	----- rock - - - - -	167
Koron island - - - - -	81	Labuk bay - - - - -	168
Korrier rock - - - - -	419	-----, tides - - - - -	167
Kota; Tayabas river - - - - -	325	----- river - - - - -	167
----- Bato town - - - - -	400	-----, bar - - - - -	168
Kotiapi village - - - - -	445	-----, directions - - - - -	193
Kowai district - - - - -	520	Ladong river - - - - -	232
Kraan river - - - - -	402	Lagnoin (or Tiklin) point - - - - -	233
Kraka island - - - - -	467	----- banks - - - - -	116
Kraan islet - - - - -	474	Lagassan town - - - - -	380
Krusut island - - - - -	475	Lagonoy gulf - - - - -	354
Kuad Basang island - - - - -	125	Laguan bay and island - - - - -	354
Kukub island - - - - -	305	-----, reef in approach - - - - -	
Kubong; Bum Bum island - - - - -	204		

	Page		Page
Laguinmanok port -	326	Laoag river, town -	43
Lagundi shoal -	286	—————, anchorage off -	43
Lahat Datu harbour -	186	Laon point and town -	293
—————, anchorage -	187	Lapa mount -	306
—————, directions -	188	Lapak island -	122
————— -lahat island; Bambannan -	142	Laparan island -	141
————— islet; Kabukan -	114	Lapat point -	324
Lahuy island -	377	Lapinin island -	290
Laibabar island -	425	Lapirauan island -	324
Laja rock; port Sisiran -	377	Lapitan point -	327
Lajan point -	434	Lapog bay -	44
Lajanosa island -	309	Lapun Lapun island -	25
Lajas rocks -	347	Larapan island -	200
Lakahia bay -	519	Larat island -	494
—————, anchorage -	519	Lardabui islet -	434
————— mount -	520	Lari islands -	430
Lakaylakay point -	365	Las Llagas shoals -	252
Lakit rocks -	107	Laai bay -	296
Lakor island -	491	Lasisi point -	60
Laktanae anchorage -	496	Lassan river -	407
Lalaigan bay -	76	Lata Lata islands -	435
Lama point -	456	Lataan island -	132
Lamak bay -	193	Latau islet -	430
Lamarche cape -	501	Latoan island -	152
Lambajon point -	389	————— reefs -	153
Lambert river -	551	Lauis point -	275
Lambusan river -	278	Laura village -	493
Lamigan point -	320	Laurel rock -	166
Laminusa anchorage -	120	Laurigau cove -	234
—————, directions -	120	Lavampa islet -	332
————— island -	120	Lawak bay and island -	500
Lamnuyan point -	139	Lawarang road -	423
Lamon bay -	372	Lawin island -	448
Lampassan island -	154	Lawler reef -	197
Lampinigan island -	103	Lawson isle -	527
Lampon port -	373	Laya laya islets -	358
Lamuyon (Solitaris) islet -	337	Layaban point -	318
Lanan river -	343	Laylay river -	331
Lanang town -	385	Leader creek -	544
Lanauan island -	109	Learnmouth reef -	128
Langaan island -	165	Lebak point and port -	401
—————, rocks eastward of -	165	Ledan mount -	25
Langao point -	348	Lee point -	544, 554
Langaran bay -	319	Leer island -	485
Langas island -	200	Legazpi mount -	308
Langasmate islands -	105	Lehnert reef -	213
Languyon point -	278	Leite island -	227
Lanhil island -	101	—————, climate -	227
Lanigan anchorage -	408	—————, North coast -	347
Lanis point, light -	286	—————, South-east coast -	302
Lankayan cay -	164	—————, West coast -	227
————— rocks -	165	Léléde rocks -	500
Lantao island -	374	Leli island -	435

	Page		Page
Leon islet - - - -	85	Lights, Kapones island - - -	56
Leonan cay - - - -	163	—, Kapul island - - -	350
— reefs E.N.E. of, beacon -	163	—, Katbalogan - - -	360
Leonidas shoal - - - -	77	—, Kavite bay - - -	63
Letayen island - - - -	394	—, Lanis point - - -	286
Lethbridge bay - - - -	349	—, Lipata bank - - -	286
Letti island - - - -	490	—, Maktan island - - -	284
Leuwarden bank - - - -	457	—, Malabrigo point - - -	226
Lian point; Ragay gulf - -	333	—, Malaguino-ilog - - -	337
— river; Luzon, S.W. coast -	69	—, Manado - - -	425
Liang point - - - -	317	—, Manigonigo islet - - -	261
Lingan bay - - - -	387	—, Manila bay - - -	62, 63
Libagao island - - - -	234	—, Mati - - -	320
Liban island - - - -	487	—, Orequita - - -	319
Libarran island - - - -	166	—, Panirugan point - - -	369
Libas point; Bohol - - -	295	—, Parang Parang - - -	398
— port, tides; Luzon, East coast	385	—, Pasig river entrance - -	63
Libobo point - - - -	431	—, Pollok harbour - - -	398
Libog town, shoals - - -	333	—, Pujada bay - - -	320
Liboho town - - - -	305	—, St. Nicholas bank - - -	63
Libukan islands - - - -	358	—, Samboanga - - -	96
Libukan dako anchorage - -	358	—, San Bernardino islet - -	351
— gutiay - - - -	358	—, — Fernando - - -	47
Light-buoy, Pasig river entrance	63	—, — Juanico strait - - -	361, 362
Light-vessels, Netherlands -	41	—, Sandakan harbour - - -	170
Lights, Aparri, Linao point -	365	—, Sangley point, Kavite - -	63
—, Amboina - - - -	463	—, Santiago cape - - -	70
—, Bagakay point - - -	282	—, Sarangani bay - - -	402
—, Bantolinas point, Maktan -	284	—, Sebu port - - -	284, 286
—, Batangas bay - - -	223	—, Siassi - - -	121
—, Bojendor cape - - -	42, 364	—, Sibuluak Babay - - -	262
—, Bugui point - - -	253	—, Siete pecados rocks - -	268
—, Burias, East coast - - -	337	—, Sual port - - -	50
—, Busainga port - - -	337	—, Súbic port (building) - -	57
—, Busin port - - - -	336	—, Sulu road - - -	113
—, Caballo islet - - -	62	—, Tablas island - - -	236
—, Cabra island - - -	71	—, Tubad point - - -	320
—, Calabazas - - - -	267	Ligitan channel - - -	211
—, Corregidor island - - -	62	—, —, tidal streams - - -	211
—, Cuyo island - - - -	86	— islands - - -	208
—, Dagupan river - - -	49	— islet - - -	209
—, Dapitan bay - - - -	320	— reefs - - -	212
—, Darwin port - - -	555, 556, 559	Liguasan lake - - -	399
—, Engaño; Burias island - -	337	Lihaga islet - - -	418
— cape; Luzon, N. coast - -	366	Lihiman islet - - -	165
—, Gigantes, North island - -	262	Lijat-Lijat rocks - - -	127
—, Glan river - - - -	402	Liki river - - -	453
—, Guimaras island - - -	243	Likok point - - -	390
—, Iloilo port - - - -	243, 244	Likupang or Banka strait - -	418
—, Kabalian point, Tablas - -	236	— road - - -	418
—, Kagayan river - - -	365	— town, supplies - - -	419
—, Kulbayok - - - -	358	Liloan point; Sebu, West coast	279
—, Kananay island - - -	352	— port; Panaon island - -	301

	Page		Page
Liloan town and river; Sebu, E. coast	282	Lokulau, shoals	317
Limasana island	301	Lola island	485
Limay point	60	Lolobato point	441
Limbakanayan island	346	Lolun island	435
Limbé island	422	Long island	438
—— strait	423	Longar village	484
Limbones islet	60	Lontar or Great Banda island	467
Limbuk plantation	185	Loog bay; Masbate island	255
Linao bay; Mindanao, South coast	401	Loran island	126
—— point; Samal island	406	Lord North island	497
Linaon bay	272	Lorna shoals	562
Linaupakan island	79	Los Carabaos reef	371
Lingayen gulf	47	—— Cochinos rocks	62
——, town, landmark	42	—— Frailes islets	57
——, winds	48	Lota or Uki island	453
Lingi point	534	Louisa bank; Celebes sea	411
Ling-gi-san rocks	161	—— shoal; Balabac strait	151
Linguin hill	383	Low point; port Essington	531
Lintago, telegraph	98, 317	Loxdale shoal	149
Liogliog point	361	Luan island	59
Lipang island	411	Luang island	491
Lipata bank	285	Luangt point	191
—— light	286	Luban point	321
—— mount	353	Lubang group	70
—— point; Luzon, South coast	327	—— island	71
——; Panay, West coast	239	—— town; Sulu island	116
——; port Sebu	286	Lubik islet	88
——; Samar, N.W. coast	353	Lubug town	251
—— Menor bank	285	Lubukan island	135
Lirung road, supplies	419	Lubutglubut island	80
Lisamatula island	439	Lucena, telegraph	326
Lisela town	451	Lucia mount	216
Little Balut island	404	Lucipara islands	470
—— Geelvink bay	511	Lag port, anchorage	236
—— Govenen island	105	——, water	236
—— Kalupag island	130	Luga islets	508
—— Keffing island	457	Lugbung island	248
—— Molleangan island	154	Luginut island	264
—— Naro island	256	Lugus island	118
—— reef; Darvel bay	126	Luhu anchorage	461
—— Santa Cruz island	99	Luk bay; Lubang	72
—— Saonek island	502	——, anchorage, supplies	72
—— Simalak island	137	Lumango point	226
—— Tawali island	435	Lumara hills	452
Livas point	354	Lumbran island	117
Loari point	441	Lumintau point	75
Loay town	294	Lumitis islet	224
Lobi islet	474	Lumukluk river	343
Lok Bakong hill	206	Lungib point	343
—— inlet	205	Lunod rock	358
Loki anchorage	461	Lupa island	136
Lokoloko or Sigayan point	227	—— Buan town	135
Lokulau, anchorage	317	Lusaran point	243

	Page		Page
Lutangan point	393	Maglubun point	399
Lutao reefs, beacons	360	Maglumba islet	174
Lutur island	477	Magpeos island	195
Luxmore head	550	Magpie bank	174
Luyan town	281	Magtimua rock	349
Luzon island	42	Magtulnok point	278
———, East coast	369	Maguiliquian point	272
———, winds	380	Magul river	193
———, North coast	364	Magun anchorage	391
———, population	42	Mahnba islet	300
———, South coast	325, 337	Mahanay island	291
——— point	348	Mahoro islet	414
———, South-east coast	351	Maiami cape	511
———, South-west coast	68, 221	Maibun bay	116
———, West coast	42	———, anchorage	117
——— point	59	———, banks	116
Lyne reef	546	———, directions	116
Lynedoch bank	524	———, supplies	117
		———, tides	117
		Maiga islet	201
Maar island; Arn islands	482	Maikun island	484
—— village; New Guinea, N. coast	510	Maikur island	480
Maba road	442	———, Sungi	480
Mabahok cay	163	Maipat channel	199
Mabintin mount	116	Maitara island	434
Mabio point	327	Majaba island; Masbate, W. coast	253
Mabo cape	505	———; Samar, W. coast	360
Mabul island	210	Majinkil islet	197
———, passage	210	Mak town, anchorage	301
Macar	402	Makaina island	291
Maclear creek	348	Makajalar bay	315
Madai mount	194	Makalaba island	54
Madford shoals	549	Makalebeh islet	414
Madilao point	303	Makalira island	52
Madurang island	457	Makambol point	391
Mæander patch; Banguay	South	Makangani island	387
——— channel	159	Makao point	278
——— reef; Sulu sea	91	Makapilay point	295
Maestre de Campo island	235	Makariki town	461
Magahiso island	441	Makassar strait (Passages)	31
Magallanes bank	81	Makaturin volcano	399
——— bay	251	Makikili point	272
Maganeki cape	511	Makolog mount	223
Maganting island	197	Makoto point	335
Magapu point	397	Maktun island	283
Magdalen bluff, beacons	58	———, light	284
Magdalena mount	216	Makugil point	339
——— port	343	———, rocks near	339
Magearagui islet	342	Makulabo island	374
Maggie reef	151	Makyan island	484
Maginok town	314	Malabrigo point	226
Maglagabon point	352	———, light	226
Maglakob town	139	Malaga river	362

	Page		Page
Malaguig-ilog light - - -	337	Mamuyon river, landmark - - -	171
Malagundi point - - -	226	Manadi rock and reef - - -	75
Malagusan point - - -	302	Manado bay - - -	424
Malajubomanok islet - - -	225	——, lights - - -	425
Malakafani point - - -	478	——, tides - - -	425
Malag port - - -	405	——, town, supplies, &c. - - -	425
Malaleo cove - - -	435	——. Tua island - - -	426
Malamaui island - - -	103	Manamok island - - -	85
Malandog river - - -	240	Manampili islet - - -	204
Malandong point - - -	185	Manavoka island - - -	459
Malangaban island - - -	265	Manay village - - -	389
Malanipa island - - -	100	Manbajao point - - -	314
Malapascua island - - -	276	Mancha Manca bluff - - -	59
——, shoal Eastward		Mandan island - - -	95
of - - -	276	Mandani island - - -	72
Malaspina mount - - -	271	Mandaon port - - -	254
Malatuna point - - -	401	Mandaui tower, town; Sebu port - - -	283
Malavatuan island - - -	72	Mandioli island - - -	437
Malavinan roadstead - - -	403	Mandiralla island - - -	161
Malay bay - - -	526	Mangal point - - -	106
—— river and village - - -	238	Mangalis point - - -	114
Malayog point - - -	352	Manganitu bay, tides - - -	412
Malhon island - - -	306	—— town, bank - - -	412
Maligay bay - - -	395	Mangarin bay and point - - -	75
Malikabok island - - -	292	Mangas point - - -	49
Malikut island - - -	140	Mangkassar banks - - -	220
Malinao port - - -	306	Mangola island - - -	439
Malindang mount - - -	317	Mangrove harbour - - -	505
Malipano anchorage - - -	406	—— point; Dent haven - - -	175
Malkatop island - - -	88	——; Essington port - - -	532
Mallawallé channel - - -	160	Mangsi channel - - -	149
——, tidal streams - - -	171	——, directions - - -	150
——, to Sandakan,		—— Danger bank - - -	148
caution - - -	171	—— Great reef - - -	148
——, to Sandakan,		—— islands - - -	148
directions - - -	170	Mangur island - - -	471
——, Eastern dangers - - -	158	Mangurukuru town - - -	266
—— island - - -	157	Mani town - - -	461
——, reefs off East end - - -	158	Maniakolat island - - -	124
Malokot point - - -	226	Manigonigo islet - - -	261
Malugan point - - -	315	——, light - - -	261
Mal'umahuan island - - -	338	Maniguin island - - -	238
Malusa bay - - -	103	Manikani island - - -	396
Mamad islet - - -	109	Manila bay - - -	60
Mamanak islet - - -	110	——, anchorage, fishing stakes - - -	64
Mamanuk islet - - -	142	——, directions - - -	63
Mambagi shoal - - -	289	——, docks - - -	61
Mambahenuhan island - - -	96	——, harbour accommodation - - -	64
Mambulao port - - -	374	——, islands, dangers - - -	61
Mamburao reef - - -	74	——, lights - - -	62
Mamori cape - - -	511	——, observatory - - -	68
Mamponon vilage - - -	389	——, quarantine - - -	62, 66
Mamuya mount - - -	441	——, river Pasig - - -	64

	Page		Page
Manila bay, semaphore - - -	60	Maribojok bay - - -	293
——, storm signals - - -	67	Marie reef; Karkaralong islands -	411
——, tides - - -	63, 566	—— shoal; Australia, N. coast -	550
——, time signal - - -	68	——, tidal streams - - -	550
——, tugs - - -	65	Margabato point - - -	397
——, weather table - - -	572	Marigo Satubig - - -	395
——, winds - - -	66	Marigondon point; Luzon, S. coast	337
—— city - - -	65	—— river; Manila bay - - -	60
——, climate - - -	66	Marikaban island - - -	224
——, communication - - -	66	—— strait - - -	225
——, supplies, coal - - -	68	Mariki point - - -	99
——, railway, telegraph - - -	66	Marinap bay - - -	340
——, trade - - -	65	Marinduque island - - -	328
——, typhoons - - -	67	Maripipi island - - -	347
—— road - - -	61	Marisan reef - - -	359
Manipa island and strait - - -	453	Mariveles point; Masbate island -	254
Maniwayan island - - -	330	—— port; Manila bay - - -	62
Manlanat island - - -	374	——, anchorage - - -	62
Mano island - - -	470	——, quarantine station - - -	62
Manok Manok isles - - -	257	——, telegraph - - -	62
Manote island - - -	126	Mark hill - - -	190
Mansalay bay, anchorage - - -	282	Marlanga mountain - - -	328
——, directions - - -	233	—— point - - -	330
Mansfield island - - -	505	Marlassi village - - -	477
Mansiol point - - -	233	Maroka or Sueste island - - -	409
Mautabuan island; Tawi Tawi	132	Marongas island - - -	114
—— islet; Darvel bay - - -	202	Marocoop river - - -	173
Mantrau island - - -	426	——, bar - - -	173
Manuna islet - - -	306	Marsh shoal, buoy - - -	547
Mannaran island - - -	500	Martin bluff - - -	111
——, shoals near - - -	500	Martinez point - - -	134
Manubul island - - -	123	Maruda bay - - -	144
Manuk Manka island - - -	133	Masahuron island - - -	388
—— Manuknu island - - -	92	Masarete district - - -	453
Manukan islet, supplies - - -	89	Masbate island, East coast - - -	345
Manungut island - - -	110	——, North-east coast - - -	342
Manyangit point - - -	151	——, South coast - - -	255
Mapait town - - -	132	——, West coast - - -	253
Mapura island - - -	487	Masela islet - - -	423
Maputi point - - -	316	Masi river - - -	282
Maqueda bay - - -	360	Masian village - - -	484
—— channel - - -	378	Masidan village - - -	477
Marakanao island - - -	85	Masigi island - - -	509
Marakitdakit rock - - -	363	Masin islet; Mindoro, E. coast -	233
Maralizon islet - - -	239	—— town and anchorage; Leite,	
Marauas islet - - -	179	S. coast - - -	300
Marasingan village, coal - - -	303	Masinlok port - - -	54
Marban bank - - -	116	Masingluk anchorage - - -	100
Marchesa bay - - -	505	—— river - - -	100
March island - - -	434	Mass island - - -	475
Maria islet; Talagit island - -	346	Matabao island - - -	342
—— mount; Borneo, N.E. coast -	216	Matabela island - - -	459
Mariaune or Dourga strait - - -	522	Mataja bank - - -	108

	Page		Page
Mataja island - - -	108	Merampi or Nanusa island - - -	409
Mataking islets - - -	203	Merapi reef - - -	493
Matalantalan point - - -	343	Meridian reef - - -	179
Mataleo cove - - -	435	Meriri islands - - -	485
Matalom village, shoal - - -	300	Merlin rock - - -	162
Matalvi island - - -	54	Mermaid channel - - -	552
—— port - - -	54	—— shoal - - -	550
Mataual point - - -	100	Merope rock - - -	78
Matandumaten islet - - -	375	Merrett reefs - - -	195
Matangal point - - -	106	Miangas island - - -	408
Matarabis islet - - -	86	Middle arm; port Darwin - - -	537
Matarinao point - - -	385	—— bank; Adam bay - - -	541
Matatindok point - - -	273	—— ground; port Darwin - - -	555
Mataya island - - -	80	—— head; port Essington - - -	532
Matayon point - - -	345	—— point; port Darwin - - -	556
Mati port, lights - - -	390	—— reef; Borneo, N.E. coast - - -	180
—— town - - -	590	——, anchorage - - -	180
Matimus point - - -	327	—— shoal; port Patterson - - -	563
Matnok bay - - -	849	Middleburg island - - -	541
Matos point; Papahag island - - -	134	Mimien island - - -	485
—— shoal; Sulu, W. coast - - -	114	Minahasa district - - -	5, 425
Matulin islet - - -	378	Minalutan bay - - -	296
Matutung volcano - - -	402	Minanga bay - - -	80
Mauban anchorage - - -	373	Mindanao island - - -	312
—— bay - - -	373	——, communication - - -	313
Maumaun island - - -	221	——, East coast - - -	327
Mauro river - - -	352	——, currents - - -	321
May Day island - - -	338	——, North coast - - -	312
—— Williams shoal - - -	152	——, winds - - -	322
Mayagao point - - -	59	——, North-east coast - - -	303, 307
Mayanga island - - -	57	——, North-west coast - - -	321
——, reef, buoy - - -	57	——, South coast - - -	322
Mayedi town - - -	439	——, tides - - -	562
Mayo bay - - -	390	——, Southern peninsula - - -	403
—— island - - -	427	—— river - - -	399
Mayraira point - - -	364	——, beacons - - -	409
McCluer inlet; New Guinea - - -	513	Mindoro island, East coast - - -	232
—— isle; Australia, N. coast - - -	527	——, North coast - - -	227
—— Kinlay reef - - -	127	——, North-east coast - - -	231
Meangis islands - - -	409	——, West coast - - -	78
Meares (Haycock) islands - - -	411	—— shoal or Batu Bolu - - -	107
Medio island; port Galera - - -	228	—— strait - - -	76
——; San Bernardino strait - - -	249	Minerva rock - - -	70, 222
Méc island - - -	492	Minglanilla town - - -	287
Meirang islet - - -	472	Minigil point - - -	380
Melano islet - - -	466	Minis island - - -	114
Melville island - - -	548	Minna reef - - -	160
Membok islet - - -	508	Minolo point - - -	228
Meunon shoal - - -	93	Mintag point - - -	346
Meupakol - - -	5, 162	Minto head - - -	632
Mengarang town - - -	410	Mios Sayu or Mispalu islands - - -	510
Menkopi island - - -	409	Misamis port - - -	317
Mentai islet - - -	485		

	Page		Page
Misamis port, anchorage	318	Mostyn mount	135
———, directions	318	Motir island	434
———, telegraph	318	Motjam islet	484
Misan Misan reef	190	Mountnorris bay	325
Miskien island	434	Moyune rock	22
Misol island	448	Mubu point	113
Mitan, Nusa, island	487	Muda island	394
Mitduan shoal	472	Muidens islands	432
Mitford harbour	154	Mulanay anchorage	327
———, directions	155	Muligi islands; Kagayan Sulu	95
Miti island	441	—— patches; Banguay South	
Mitnaloa shoal	472	channel	160
Mitra mount	326	Mulinao town	381
Miroa shoal	473	Murciélagos bay	319
Mituwat shoal	472	—— islands	322
Miulu anchorage	413	—— islet	319
Moa island	490	Mutul town and anchorage	402
Moangai strait	491	Myrmidon bank	496
Moar island	443		
Mobai islet	259	Nabalas village	270
Mobo bay	344	Nabob shoal	447
—— shoal	344	Nabug town	384
Moises headland and mount	368	Nabugtu islet	256
Mokabok point	274	Nabugtut islet	254
Moko bay	138	Nabulao bay	278
Mokotamba point	419	Nabunut islet	261
Molleangan islands	154	Naburul islet	242
Molo, church dome	241	Naburut island	265
—— town	244	Nadulao islet	243
Molu island	495	Naga town and anchorage	287
Molucca passage	427	Nagarao islet	256
Moluccas, The	5	Nagas point	385
———, extent and population	6	Nagubat islet; Semirara islands	234
———, prevailing winds and		—— islets; Mindanao, N.E. coast	307
weather	13	Nagumbuayan point	379
Mombrani cape	511	Naguran islet	256
Momos town	502	Nahabui island	362
Mompog island	327, 330	Nahuan islet	130
—— strait	83	Nailog river	251
Money shoal	525, 528	Nailon point	280
———, tidal streams	525	Nain island	426
Mongos Mongos isles	51	—— Kechil	426
Monja, La, (Haycock) rock	62	Nakaban point	58
Monte, point del	228	Nakopot point	354
Montero shoal	252	Nalabia bay	466
Monti islet	62	Nalupa town, banks off	239
Montugan point	359, 384	Namagpakan town	46
—— reef	352, 384	Namanuko point	224
Moorhen reefs	194	Nanga islets	72
Moreha road	502	Nangan point	324
Moro island	104	Nangaba islands	308
Morti island	440	Nangalao island	82
Mosquito rock	162		

	Page		Page
Nanu island - - -	290	Nichols reef - - -	196
-----, anchorage - - -	291	Nicholson banks - - -	89
Nanusa islands - - -	409	----- reef - - -	91
Napakao point - - -	294	Nika islet - - -	488
Napayauan islet - - -	254	Nila island - - -	488
Nara point - - -	401	Nin banks - - -	254
Naranjos islands - - -	349	----- bay, anchorage - - -	254
Naro bay; Masbate, N.E. coast - - -	344	-----, banks - - -	254
----- islands; Masbate, South coast - - -	256	Nipa point - - -	259
Narvaez bank; Kalamianes islands - - -	81	----- Nipa island - - -	191
-----; port Misamis - - -	317	Nitu islet - - -	463
-----; Sebu island - - -	285	----- river - - -	451
Nasipit town - - -	313	Noche Buena channel - - -	131
-----, anchorage - - -	313	-----, directions - - -	131
Naso point - - -	240	Nogas islet - - -	240
Nasog point - - -	238	Nonok town - - -	305
Nassau rock - - -	430	Nonokong, East, island - - -	220
Nasugbu bay, anchorage - - -	69	Normandy bank - - -	174
----- point, town - - -	69	Normanhurst reef - - -	197
Natunaguan point - - -	381	Nortada winds - - -	22
Naujan river - - -	231	North Borneo dangers - - -	156
Nauko point - - -	257	----- cape; Celebes island - - -	418
Nautilus reef - - -	487	----- channel; Clarence strait - - -	547
----- strait - - -	518	-----; port Galera - - -	229
Navabay island - - -	361	----- east bank; Kagayan Sulu - - -	94
Navigation, notes on - - -	xix-xxx	----- and South-west bluffs - - -	163
Nayun river; Lazon, W. coast - - -	53	----- Gigante island - - -	262
-----; Tayabas bay - - -	325	-----, light - - -	262
Negra point - - -	364	----- Guhuan island - - -	151
Negros island - - -	271	----- Gusan reef - - -	120
-----, East coast - - -	274	----- hill; Aru islands - - -	481
-----, North and North-west coasts - - -	271	-----; Banguey island - - -	147
-----, South-west and South-east coasts - - -	273	----- island; Tifori - - -	427
-----, telegraphic communication - - -	271	----- islet; Mallawallé - - -	158
-----, West coast - - -	272	----- Mangai island - - -	148
Neiguli village - - -	481	----- rock or Kolokoto - - -	79
Neira island - - -	467	----- Shell island - - -	556
New Guinea, Dutch territory - - -	12	----- Ubian island - - -	140
-----, trade - - -	12	----- west bank; Kagayan Sulu - - -	94
-----, general remarks - - -	11	----- channel; port Galera - - -	229
-----, history - - -	10	----- (and North Borneo) dangers - - -	156
-----, North coast - - -	510	----- islet; Mallawallé - - -	158
-----, political divisions - - -	12	----- point; port Palanog - - -	343
-----, West coast - - -	497	----- rock (Dichilem) - - -	79
-----, winds and weather - - -	17, 497	----- Vernon island - - -	545
----- Hatiling village - - -	456	Northumberland shoal - - -	410
----- Year isle - - -	527	----- strait - - -	78
Ngidun point - - -	473	Nosela islands - - -	512
Ngoba islet - - -	477	Notch hill - - -	172
Niata island - - -	487	Nottan district; New Guinea - - -	512
		Nueva Carceres town - - -	376
		Nuhu Jaan island - - -	472

	Page		Page
Nuhu Roa island - - -	473	Onate rock - - -	304
Nunex de Prado shoal - - -	281	Ondur anchorage - - -	459
Nunuyon Derat - - -	168	One Tree point - - -	526
—— Laut - - -	168	Onin district - - -	516
Nusa Besi - - -	489	Oot point - - -	354
—— Ela - - -	455	Opol bay - - -	316
—— Keli - - -	6	Opon tower - - -	283
—— Lakit - - -	137	—— town - - -	284
—— Laut - - -	466	Orange Nassau peninsula - - -	517
—— Mitau - - -	487	Ordenez bank - - -	345
—— -put-puti - - -	487	Orequita town - - -	319
—— Takbu - - -	137	——, light - - -	319
——, channel - - -	138	Orlem rocks - - -	457
Nusaniva point - - -	462	Ormok bay, anchorage - - -	299
Nusatonga islet - - -	204	—— town - - -	299
Nuswotar island - - -	495	Ormsby bank - - -	444
Nymphe reef - - -	172	Orok mount - - -	267
		Orontes reef - - -	530
		Orse islets - - -	508
		Oslob point - - -	289
Obit island - - -	437	Osong peak - - -	460
Observation cliff - - -	531	Osteng shoal - - -	286
—— point - - -	534	Oton bank - - -	240
Oehoa bank - - -	254	——, buoys - - -	241
Odel island - - -	108	—— church dome - - -	241
Offak harbour - - -	499	Otto island - - -	442
Ofiling islets - - -	500	Oud Krei town - - -	482
Oger island - - -	514	Ourata island - - -	409
Ogton point - - -	276	Outer Latoan patch - - -	153
Oiori river - - -	511	—— shoal; Banguey South channel - - -	156
Okbok hill - - -	258	Oxley isle - - -	527
Okenao islets and reef - - -	491	Oyon bay - - -	54
Okmok shoal - - -	281	Oyster point - - -	532
Oko islet - - -	85		
Okre point - - -	274		
Oktok point - - -	334		
Olango island - - -	292		
Glanivan islet - - -	405		
Olillet village and anchorage - - -	493	Paarl bank - - -	437
Oliver reef - - -	547	Pachevo shoa' - - -	88
Olongapo port - - -	57	Packnam shoal - - -	164
——, beacons - - -	58	Padang bank - - -	220
——, communication - - -	58	——, coaling station - - -	436
——, directions - - -	58	Pagadian bay - - -	396
——, inner basin, buoys - - -	58	——, shoals - - -	396
Olutanga island - - -	323	Pagalad town - - -	249
Olutaya island - - -	259	Pagapas bay - - -	222
Omadal islet - - -	204	Pagassan island - - -	154
Omapui island - - -	178	Pagbilao bay - - -	326
Ombi Latu - - -	438	——, pilots - - -	326
—— Major - - -	438	—— chica island - - -	326
Ombira island - - -	438	—— grande island - - -	326
Omon point - - -	334	Pagbulungan point - - -	254

	Page		Page
Pagjuriran point - - -	384	Panabutan bay - - -	323
Pagpatayan creek - - -	405	Panagatan islet - - -	77
Paha point - - -	455	----- reef - - -	77
Paitan river - - -	184	Panahonga point - - -	377
Paluan village - - -	399	Pannakan river - - -	407
Pakalor islet - - -	424	Panalisan point - - -	399
Pakia island - - -	119	Panaluran port - - -	362
Pakiputan point - - -	406	Pananpangari islet - - -	132
----- strait - - -	407	Panaon island - - -	301
Pala point - - -	438	Panay island - - -	237
Palad bank - - -	332	-----; Katanduanes - - -	380
Palak (Pollok) harbour - - -	397	-----; North and East coasts - - -	256
-----, lights - - -	398	-----, South coast - - -	240
Palanan bay and river - - -	369	-----, South-east coast - - -	266
Palauit point and river - - -	352	-----, tidal streams - - -	260
Palanog port - - -	343	-----, West coast - - -	238
-----, beacon, buoys - - -	344	----- shoals - - -	81
-----, directions - - -	344	Pandalusan island - - -	393
Palapa mount - - -	384	-----, dangers near - - -	393
----- port - - -	354	Pandami island, anchorage, supplies - - -	123
-----, anchorage - - -	355	Pandan bay; Panay, W. coast - - -	238
Palatuan bay - - -	338	-----; Sanga Sanga - - -	134
Palau island - - -	366	----- hill; Guimaras - - -	242
Palauig point and bay - - -	55	----- islands; Mindoro, W. coast - - -	74
----- reefs - - -	55	----- islet; Cuyo - - -	87
Palawan island - - -	79	----- point; Mindoro, E. coast - - -	233
-----, winds - - -	18	-----; Negros island - - -	243, 272
Paliyon islet - - -	354	-----; San Bernardino strait - - -	349
Palm bay - - -	528	Pandanun - - -	125
Palma river - - -	239	-----, anchorage - - -	127
Palma brava island - - -	392	Pandanpandang - - -	118
Palmas island - - -	408	Pandarochan bay, anchorage - - -	76
Palmerston town - - -	561	Pandasan island - - -	407
Palombon islets - - -	378	Pandukan island - - -	139
Palompon port, town, supplies - - -	298	Panga point - - -	397
Palos bay - - -	5	----- Sinan province - - -	49
----- reef - - -	363	Panganaa islet - - -	112
Palpito point - - -	451	Panganiran point - - -	335
Paluan bay, anchorage - - -	73	Pangasahan point - - -	105
Palumbanes islands - - -	379	Pangasinan island - - -	114
Palundangan islet - - -	197	Pangatatana islet - - -	88
Pamagbaran rock - - -	129	Panglao island - - -	293
Pamakalan rock - - -	129	Pangan islet - - -	181
Pamalikan island - - -	85	Panguil bay - - -	317
Pambujan anchorage - - -	385	Pangutarang island - - -	139
Pamelukan bank - - -	103	----- passage - - -	140
Pamilakan island - - -	294	Paniki point; Marinduque island - - -	330
Paminuitan town - - -	293	-----; Masbate island - - -	344
Pamitinan islet - - -	88	Panikian island; Mindanao, S. coast - - -	325
Pamokau point - - -	58	-----; port Galera - - -	229
Pamuntangan reef - - -	360	Panirungan point - - -	362
Pan de Azucar island - - -	264	-----, light - - -	362
Panabulon island - - -	363	Panjang island; Goram islands - - -	459

	Page		Page
Panjang island; New Guinea, W. coast	517	Passages, Saigon to Manila	38
Panjumajan island	129	———, Singapore to Australia, N. coast	39
Pansiguikan town	362	——— Moluccas	38
Pansipit river	222	——— through the Sulu sea	36
Pantao town	335	———, Verde island passage	35
Panto Panto point	294	Passi Lamo reef	429
Pantokunan island	115	Passigi island	415
Panubigan islands	392	Passinondang bank	437
Papahag island	134	Pata island; Sulu island, S.W. coast	118
Paperu point	466	—— point; Luzon, W. coast	365
Papua island	473	Pataluan point	114
Para Para islet	442	Patanunam island	154
Paradise harbour	505	Patao point	276
Paragua channel	132	Patapat mountains	365
Parakale point and town	375	Patent slips, Kavite	28
Paranan bay	349	Patian island	117
Paranaque town	61	Patiente strait	430
Parang island; Ceram, E. coast	457	Patikolo town	112
—— village; Sulu island	115	Patimuni point	517
—— Parang anchorage	327	Patippi bay	514
Paragaan islet	123	Patol hill	59
Parasan island	361	Patterson port	562
Parol island	110	———, directions	564
Paron point	383	———, tides	564
Parry shoal	550	Patuko port	404
Pasahan river	104	Patunga islet	88
Pasakao anchorage	384	Patungan cove	60
Pasalat reef	204	Pauay point	275
Pasegan Guimba island	127	Paya island; Mindanao, S. coast	394
—— Samal island	127	—— islets; Cuyo islands	88
Pasig river	64	Payahe road	430
———, lights	63	Payne rock	180
Pasigajon point	295	Paypay town	277
Pasijan islet	299	Peaked hill	559
Pasir Galesa besar	429	Pearl bank, anchorage	142
—— Rajah bank	430	———, tides	142
Passage islands	413	Pechili reef	879
—— reef; Mallawallé island	161	Pegasus reef	172
Passages, America to Philippines	32	Peka point	453
———, Australia North coast to Singapore	29	Pela point	453
———, China sea, general remarks	30	Pelew islands	497
——— to Australia, East coast	33	Pelotes rocks	305
——— Port Darwin	35	Penambulai island	484
——— Torres strait	34	Peñascales point	306
———, Europe to Manila	31	Penguin mount	554
———, Manila to Hong Kong	37	Pepitas rocks	267
——— Iloilo and Sebu	36	Pequeña island	57
——— Saigon	37	Pernambuan coaling station	436
——— Singapore	31	Peron isles	564
———, Philippines to America	32	Perseus bank	252
		Pescador islet	279
		Petano point	428

	Page		Page
Petermann island - - -	509	Pineda shoal - - -	252
Petley point - - -	111	Pinget island - - -	45
Petael rock - - -	137	Pinitan point - - -	376
Petta anchorage, buoys - -	413	Pinon island - - -	512
Philippine islands - - -	1	Pintada island - - -	132
-----, climate - - -	2	Pinulakan point - - -	281
-----, commerce - - -	40	Piper head - - -	550
-----, earthquakes - - -	2	Piratas rock - - -	394
-----, extent, population -	2	Pris bay - - -	333
-----, navigation amongst -	3	Piru bay - - -	461
-----, prevailing winds -		Pisan point and port - -	396
-----, and weather - - -	12	Pisang bay; New Guinea - -	521
-----, products - - -	2	----- island; Bauda islands -	467
-----, railways, telegraphs -	3	----- i Gillolo passage - -	448
-----, tides - - -	565	----- islets; New Guinea - -	513
-----, typhoons - - -	3	Pisok cape - - -	424
Piakan point - - -	324	Pitogo bay; Sulu island, S.W. coast	118
Piapis harbour - - -	499	----- island; Taebun channel -	378
Pick island - - -	487	----- town; Luzon, S. coast -	327
Piedra Rosario shoal - - -	243	Piton mount - - -	194
Piedras point, light; Burias island -	337	Pitt or Sagueni strait - - -	506
-----, semaphore; Luzon, W. coast -	52	----- passage - - -	449
Pigeon channel - - -	514	Playa Honda - - -	55
----- island - - -	504	Plus island - - -	131
-----, coral reef near - - -	504	Pobre islet - - -	256
Pigot or Ume point - - -	501	Pock mount - - -	208
Pilar port - - -	309	----- range - - -	207
Pilas channel - - -	108	Pola point - - -	402
----- island - - -	107	Polak bay - - -	231
Pili town - - -	266	Polau mount - - -	267
Pilis bay - - -	382	Poliki bay - - -	383
Pilots, Dagupan river - - -	48	Polillo harbour, town - - -	372
-----, Darwin, port - - -	560	----- island - - -	372
-----, Dobbo harbour - - -	480	Pollok harbour - - -	327
-----, Goram island - - -	459	-----, anchorage - - -	398
-----, Gubat harbour - - -	351	-----, lights - - -	398
-----, Iloilo - - -	245	-----, tides - - -	398, 569
-----, Kagayan river - - -	366	-----, town - - -	397
-----, Pagbilao bay - - -	326	-----, winds - - -	398
-----, San Juanico strait - -	362	Polo point - - -	319
-----, Sebu - - -	284, 286	Pom pom pulo - - -	202
-----, Siassi port - - -	122	Pombo islet - - -	465
-----, Surigao strait - - -	307	Pomelikan island - - -	95
Piña island - - -	257	Pondang island - - -	414
Pinaguapan island - - -	374	Ponson island - - -	300
Pinamalan river - - -	232	Ponte bank - - -	254
Pinamukan point - - -	224	Pontud bank; Masbate, N.E. coast -	344
Pinamuntangan bay and point -	328	-----; Panay, N.E. coast -	258
Pinandungan point - - -	374	Popham bay - - -	534
Pinatubo mountain - - -	55	----- hill - - -	534
Pinatayan bank - - -	397	Poros island; Kamotes islands -	300
Pine creek - - -	561	----- islet; Biliran channel - -	347
		Portuguese bay; Amboina - -	463

	Page		Page
Portuguese point; Lingayen gulf	49	Putik point; Sulu, S.W. coast	116
Potbakers island	434	Putili island	325
Pottopau point	502	Putri mount	217
Powati anchorage	434	Pyramid hill	196
Power spit	191		
President shoal	29		
Price knoll	547	Quail islet	563
Prince of Wales bank	31	Quarantine, Manila	62, 66
Princess Marianne strait	522	Queen of the Seas bank	88
Princessa; Paláwan	87	Quoin hill; Labuk bay	167
Providential bank	521	—; Sibuko bay	217
Prueba bank; Sibuyan island	250		
— rock; Luzon, E. coast	372		
Puan pulo	202	Rabal village	484
Pucio point	238	Rabon river	47
Pudsey reefs	193	Raffles bay	529
— Dawson dangers	160	Ragalumbi island	264
— ward of	160	Ragay bay	334
Puerto point	366	— gulf	332
Pugut point	113	—, tides	335
Pujada bay and island	390	Ragged hill	173
—, light	390	Railways	30
Puju bank	107	Rainfall table, Dutch islands	574
Pulanauta point, anchorage	255	Rainy seasons	18
Pulo Aor	31	Ram islet	510
— Bati	199	— rock	507
— Bui; Sandakan harbour	168	Ramon shoal	88
— Gusong	167	Rapu Rapu island	382
— Kalinaen	421	Rasa island; St. Bernardino strait	349
— Katinai	431	— islands; Luzon, E. coast	375
— Linkabo	168	— islet; Dinagat island	305
— Matakang	203	Rashleigh reef	197
— Moar	443	Raso islet	363
— Mogogimbun	421	Raton islet	53
— Pulumbato point	344	Rau island	441
— Pura-pura	167	Razaket islet	457
— Sapatu	31	Real point, shoals	60
— Tetabuan	168	Record point	531
— Tikus	167	Recovery rock	444
Pulut point	318	Red island	452
Pumpangan village, shoal, anchorage	229	— rock	397
Punas point	226	Redondo mount	305
Punuan island	121	Reef island	508
Punungan town	116	— point; Dent haven	175
Pupú islet	281	—; port Essington	531
Purdie patches	179	Refugio island; Tañon strait	274
Puro islet; Nin bay	254	— islet; Ragay gulf	334
— islets; Tikao island	340	Rembang shoal	471
Pusau point	389	Remus rock	347
Pusgo port	333	Renard shoal	586
Putiao port	338	René shoal	174
Putik island; Cuyo island	87	Repos island	500

	Page		Page
Revolving storms - - -	18	Saban point - - -	330
Reynoso bank - - -	252	Sabang point; Romblon - -	248
Rhun island - - -	467	—— river; Luzon, S. coast	339
Richards reef - - -	202	Sabankat islet - - -	201
Riddells reef - - -	180	Sablayan anchorage, supplies	74
Rifleman rock, buoy - -	150	—— point - - -	74
Rio Agno - - -	49	Saboukogan point - - -	258
—— Chico - - -	366	Sabuda island - - -	513
Rios rock - - -	396	Sabun island - - -	334
Rivera point - - -	58	Sacripante mount - - -	297
Roach reefs - - -	213	Saddle hill; Borneo, N.E. coast	208
Rocky patches; Van Diemen gulf -	541	——; port Essington - -	532
—— point; Bathurst island -	553	—— island; Karkaralong islands	411
Roda shoal - - -	252	—— islands; Borneo, N.E. coast	191
Roe mount - - -	537	Sagai pulo - - -	191
Roldan shoal; Basilan strait -	100	Sagarayan island - - -	296
——; Sibuyan channel -	252	Sagayan island - - -	291
Roma island - - -	487	Sagausuau point - - -	344
Romblon island - - -	245	Sagay town - - -	314
—— port - - -	248	Saguai point - - -	381
——, anchorage, supplies -	248	Saguien island - - -	506
——, directions - - -	248	Sagurun mount - - -	335, 337
Romero shoal - - -	250	Saha (South) island - -	402
Romulus bank - - -	254	Sahul bank - - -	524
Roña islet - - -	367	Sail rock - - -	79
Rooper rock - - -	546	Sailolof anchorage - -	507
Rosalia reef - - -	91	Saima head - - -	219
——, current - - -	91	——, boundary beacons	219
Rosaria point and river - -	226	St. Asaph bay - - -	550
Rosas point - - -	248	——, directions - - -	551
Rosenberg strait - - -	473	—— John's reef - - -	379
Round harbour - - -	449	—— Michael islands - -	22
—— islet - - -	168	—— Nicholas bank; Manila bay	60
Royalist rock - - -	172	——, beacon - - -	61
Rozengain island - - -	468	——, light - - -	63
—— reef - - -	468	—— church, light; Sebu	284
Ruang island - - -	414	—— Thomas mount - -	47
Ruba point - - -	431	—— port - - -	48
Rubi shoal - - -	350	Sait anchorage - - -	465
Ruib island - - -	446, 498	Sakar island - - -	187
Ruige point - - -	430	——, boat channel - -	188
Ruloff islands - - -	517	Sakol chanuel - - -	322
Rumadan island - - -	475	—— island - - -	100
——, reefs - - -	475	Sal islets - - -	266
Rumah Kuda bay - - -	487	Salakan islet - - -	201
Rumakia village - - -	461	Salawai cape - - -	441
Ruwe cape - - -	511	Salengading islands - -	428
		Salibabu island - - -	410
		Saligit mount - - -	267
		Salikiti cape - - -	514
		Salimbubuk islet - - -	82
		Salingsingan island - -	148
		Saloi islands - - -	431
Saac island - - -	291		
Sabah - - -	4		
Sabalag bank - - -	53		

	Page		Page
Salomague gap; Luzon island	44	San Fernando, lights	47
— island	44	—, point	47
— point; Marinduque island	330	—, port, supplies	47
— port	44	—, telegraph, typhoon	
Salomaki island	431	— signals	47
Salt-water arm; Adelaide river	543	—, town; Luzon, W.	
Salupin island	108	— coast	47
Salutun island	509	—; Seba	288
Salwatti island	506	— Ildefonso cape	370
Sanal island	406	— Isidro town, mount	49
Samales islands	109	— Jacinto port	341
Samang village	478	—, anchorage	341
Samanput island	135	—, tides	341
Samar island, East coast	384	— Joaquin	240
—, North-west coast	352	— José point; Manila bay	60
—, South coast	386	—; Negros island	275
—, West coast	358	—; Tikao island	341
— shoal	100	— José de Buenavista	240
Samarang point	151	— Lagonoy	381
Samatti, anchorage, directions	507	— Juan town	46
—, town	507	— Pamplona river	365
Sambabuans islets	347	— Juanico strait	361
Sambakki strait	437	—, lights	361, 362
Samboanga, anchorage	96	—, pilots	362
—, coal, supplies	97	— Martin point	235
—, communication, sub-		— Mateo town, anchorage off	96
— marine cable	97	— Miguel bay; Luzon island	375
—, light	96	— island	382
—, tides	93, 569	— islet; San Miguel bay	876
—, town	96	—; Tikao	341
Samboanguita point	273	— port	340
Samboara bay	410	— Narciso town	333
Sampinitan channel	397	— Paskual fort; Burias island	336
Samson patches	152	— Pedriño mount	222
San Agustin cape	391, 408	— point	222
— town	343	— Pedro bay; Samar island	362
— Andres island; St. Bernardino		—, islands and reefs	363
— strait	349	— point; Romblon island	249
— islets and point; Marinduque	329	— town; Panay	239
— or Banalakan port	328	— Rafael bay, water; Basilan is-	
—, direc-		— land	104
— tions	329	— point; Tikao island	340
— Antonio mountain	398	— village; Lubang island	72
— point	341	— Salvador island	54
— Bernardino islet	351	— Vicente island	367
— light	351	— port	367
— strait	348	—, anchorage	367
—, directions	357, 384	—, directions	367
—, tides	356	— tower; Lubang island	71
—, winds	355	Sanayon town	260
— Estevan port	46	Sandakan harbour	168
— Fabian town	48	—, anchorage	170
		—, coal, supplies	170

	Page		age
Sandakan, communication, telegraph	169	Saouni harbour	501
———, Elopura town	169	Sapa Gaya bay; Sandakan harbour	169
———, lights, pier	170	Sapalalu strait	439
———, tides	170	Supao port	310
———, trade	170	Saparua bay, rainfall	466, 574
Sandingan island	292	——— island	466
Sandugan point	295	Sapei cape	517
Sandy island; Borneo, N.E. coast	163	Sapian bay	259
———, beacon	163	Saracen bank	77
———, coral patches near	163	Sarang islets	191
———; Limbé strait	423	Sarangani bay	402
———; Sibuko bay	214	———, light	402
——— islands; Sulu sea	90	——— cape	403
——— islets; port Bremer	529	———, tidal streams	403
——— point; Kasiguran bay	371	——— islands	404
———; Wossa bay	442	Saraweri strait	519
Sang town	118	Sarmena point	451
Sanga Sanga island	134	Saroma point	453
Sanguluan rocks	413	Sarracene bank	77
Sangboy islands	106	Saru river	385
Sangir islands	5, 411	Sasa islet	132
Sangley point	61	Satan's rock	305
———, light	63	Satildkit islet	107
Sanguisiapo islet	133	Sawai harbour	455
Sanko point	388	Sawan anchorage	414
Sankol point	389	Searf point	505
Sannana bay	440	Schildpad islands; New Guinea, W.	
Santa town	45	——— coast	512
——— Ana port	242	——— reef; Tenimber islands	494
——— Cruz bank; Basilan strait	99	Schoterug island	446
——— island; Marinduque is-		Schuck reef	160
——— land	329	Seamew reef	443
——— islands; Basilan strait	98	Seasons; Borneo, N.E. coast	144
——— point; Dalsol bay	53	———; Philippine islands	2
———; Marinduque is-		Sebu island	277
——— land	329	———, East coast	280
——— port; Dalsol bay	53	———, West coast	277
———; Marinduque island	329	——— port	282
———, directions	329	———, buoys	285
——— Filomena shoals	88	———, coal	285
——— Lucia town	46	———, communication	285
——— Maria port	823	———, lights, pilots	284, 286
——— Rita island	361	———, North entrance	282
Santare islet	438	———, South entrance	285
Santatan	68	———, supplies	284
Santiago cape	70, 221	———, tides	285
———, light	70, 221	———, time signal	285
———, telegraph	70, 222	———, town	284
——— island	51	———, trade	284
——— port	46	Seco bank and islet	239
Sao islet	437	Second Passage island	508
Saonek island	502	Sedaria point	510
Saosio town	434	Seeland island	509

	Page		Page
Segaar bay - - - -	514	Siargao island - - -	309
Segama river - - -	173	Siasib Taujong - - -	162
——, bar - - - -	173	Siassi island - - -	119
Segannen river - - -	186	—— port - - - -	121
Seira island - - - -	495	——, anchorage - - -	121
Sekelur island - - -	495	——, directions - - -	122
Sekola point - - - -	455	——, light - - - -	121
Sekubun island - - -	132	——, pilots - - - -	122
Selaru bay, anchorage	426	——, tidal signals - - -	122
—— island - - - -	496	——, tides - - - -	122
Selé (English) point -	508	Siaton point - - - -	273
—— (Kabobolol) strait	507	Siau island - - - -	414
——, anchorage - - -	509	Sibago island - - - -	101
——, directions - - -	508	Sibahong river - - -	193
——, tides - - - -	509	Sibala mount - - - -	260
Selema bay - - - -	455	Sibale island - - - -	305
Selu island - - - -	495	Sibalon river - - - -	239
Selun island - - - -	123	Sibang town - - - -	381
Semai island - - - -	517	Sibanok islet - - - -	305
Semaruga point - - -	397	Sibaton island - - -	235
Samawang point - - -	168	Si-ba-uug reef - - -	165
Semieuw islands - - -	518	Sibay island - - - -	235
Semirara islands - - -	234	Sibet river - - - -	183
Semora point - - - -	518	Sibetik island - - -	218
Sentry bank - - - -	174	——, British and Dutch	
——, currents - - - -	174	boundary - - - -	219
Serai anchorage - - -	490	Sibolon island - - -	235
Serang island - - - -	517	Sibonga anchorage; Sebu island	288
—— sea - - - -	449	—— port; Surigao strait	309
Serantes shoal - - -	117	Sibono point - - - -	334
Serbat point - - - -	473	Sibu island - - - -	429
Serec bay - - - -	410	Sibuan islet - - - -	202
Sermatan island - - -	491	Sibugay islet - - - -	346
Serua island - - - -	488	Sibugay bay - - - -	392
Serwaru anchorage - -	490	Sibuko bay; Borneo - -	207
Serwatti islands - - -	2, 486	——; Mindanao island	324
Seven islands - - - -	513	—— river - - - -	220
Shaggy rocks - - - -	498	Sibulan island - - - -	394
Shanpi islands - - - -	442	Sibuluak (Gigantes) islands	262
Shark bay - - - -	549	—— islet; Noche Buena channel	181
Sharp peak; Lagonoy gulf	380	—— Babai island - - -	262
——, shoals southward of	380	——, light - - - -	262
——; Panay - - - -	260	—— Lalaki island - - -	262
Shoal bay - - - -	544	——, anchorage - - -	262
—— point - - - -	185	Sibutu island - - - -	178
Shoe islet - - - -	499	—— islands and reefs - -	177
Si Amil island - - - -	209	—— passage - - - -	177
Siagut point - - - -	150	——, tides - - - -	177
—— shoal - - - -	150	—— peak - - - -	178
Sial point - - - -	461	Sibuyan and Masbate, chaunel be-	
Sialat point - - - -	379	tween - - - -	251
Siang island - - - -	445	——, directions - - -	253
Siapon bay - - - -	299	—— island - - - -	249

	Page		Page
Sibuyan island, North-east reefs of	251	Silnag islet	180
Sidangoli islands	429	Silumpat island	198
—— point	429	Silungan islet	207
Sidongal mount	198	Silupa village	394
—— tanjong	199	Simaddel island	162
Sidun island	428	Simalak or Tataan island	137
Sierra de Lobo	226	Simaluk island	125
—— Pico de Loro	60	Simanale anchorage	136
—— Madre	42	Simangul point	324
Sieta Pecados rocks	268	Simara island	236
——, light	268	Simengaris river	219
Sigaboy island	408	Simisa island	110
—— village	407	Simo banks	70
Sigalong river	196	Simonor island	133
—— trusan	195	Simporna settlement	205
Sigayan bay; Mindanao, S. coast	397	Sinagbuan islet	131
—— point	397	Sinalong mount	196
——; Luzon, S.W. coast	227	Sinclair point	552
——; Panay, N. coast	258	Sindangan bay	321
Sigboye island	125	Sinokalan river	48
Signale, international	29	Sinonog island	100
Siit port	273	Sipadan islet	212
Sikayak point	321	Sipak island	110
Sikijor island	295	Sipaka point	314
Sikogon bay; Mindanao island	323	Sipalay bay	273
—— channel	264	Sipalon island	333
—— island; Panay island	263	Sipangao islet	204
—— point	323	Sipankot island	178
—— shoal	263	Siparay islet	87
Siladen island	426	Sipayu island	137
Silakay point	403	Sipindung cay	163
Silakwi islet	51	Sipit river	196
Silam	192	Sipitong river	144
——, anchorage	192	Sipungut channel	131
——, directions	189, 193	Sir George Hope islands	538
——, harbour	189	Siraguay river	323
——, mount	182, 190	Sirugai point	116
——, supplies	192	Siruma bay	376
——, tides	192	—— island and point	376
Siland bay	228	Sisir village	515
Silangan point	113	—— Watu channel	486
Silanguin port	56	Sisiran port	377
Silankapo point	327	Sisters, Tho	52
Silapag passage	205	—— peak; Celebes, N.E. coast	422
Silat islet; Cuyo island	63	Skertehley mount	194
——; Mindoro, E. coast	234	—— point	194
Silay, anchorage	272	Smith point; port Essington	530
Silibukan river	186	—— reef	530
Silingaan island	166	——; Clarence strait	547
Silino island	320	Snake bay	542
Silk island	160	Snapan island	506
Silla point	320	Soai Soaitun bay	182
Silonay islets	231	Sobinni anchorage	494

	Page		Page
Sogod-town - - -	281	Suangi island; Banda sea - -	467
Soguikay bay and island - -	233	—— islet; Manipa strait - -	433
Sejoton point - - -	272	Suay town - - -	272
Solbek bay - - -	46	Subaang bay and town - - -	230
Solitario islet - - -	82, 337	Súbic port - - -	37
Solot point - - -	43	——, directions - - -	39
Sombokoben bay - - -	332	——, light building - - -	37
Sombrero island; Kabulauan -	82	——, settlement - - -	38
——; Panay, E. coast - - -	265	——, tides - - -	39
——; Ragay gulf - - -	335	Subig port - - -	37
—— islet; Marikaban island -	224	Suburguin point - - -	328
—— rock; Luzon, W. coast -	83	Sudara mountain - - -	422
Sophia reef - - -	438	Sudi mount - - -	462
Soraing island - - -	502	Sueste island - - -	402
Sorong cape - - -	510	Sugar Loaf; Labuy island - -	377
Sorsogon port - - -	338	——; Waigiu island - - -	499
——, anchorage - - -	339	Sugot bay, coal seam - - -	384
——, Boca Grande - - -	339	—— river and town - - -	384
——, supplies - - -	339	Sula islands - - -	439
Sostoa bank - - -	254	—— Besi island - - -	440
South Alligator river - - -	532	Sulade island - - -	115
—— channel dangers (Banguey) -	157	Sulat port - - -	382
—— clearing - - -		Sulauang point - - -	216
—— marks - - -	157	Sultan bank - - -	86
——; Clarence strait - - -	547	Sultana bank - - -	89
—— east Banguey dangers - -	156	Sulu archipelago - - -	3, 102
—— Gigante island - - -	262	——, products - - -	3
—— Mangsi island - - -	148	—— group - - -	110
—— Saha island - - -	409	—— island - - -	110
—— Tub Bataha reef - - -	91	——, climate - - -	110
—— Ubian island - - -	127	——, population - - -	111
—— west bank; Manuk Manukan -	92	—— roadstead - - -	112
—— Vernon island - - -	546	——, anchorage - - -	113
Southport town - - -	557	—— sea - - -	14, 82
Spear point - - -	532	——, currents - - -	25, 83
Spencer cape - - -	510	——, tidal streams - - -	83
Standard Time - - -	28	——, winds - - -	14, 82
Steenboom cape - - -	520	—— town - - -	113
Steep point - - -	431	——, light - - -	113
Stephens' bank - - -	541	——, supplies - - -	113
—— point - - -	540	——, telegraph cable - - -	113
Stewart peaks - - -	120	Sulan island - - -	306
—— point - - -	522	Sumabun polo - - -	121
Stone point - - -	219	Sumbaa point - - -	403
Straggler islet - - -	158	Sumilon island; Sebu sea - -	289
——, reef S.E. of - - -	158	——; Surigao strait - - -	304
Stuart point - - -	540	Sun strait; Banda island - -	467
Sua islet - - -	475	Sunday bank - - -	174
Sual port - - -	49	Sungei Gum-gum - - -	167
——, directions - - -	50	—— Madai - - -	195
——, light - - -	50	Sungi Barkai or Koba - - -	485
——, supplies - - -	50	Suok town - - -	112
Suang-bunah - - -	140	Surat islet - - -	477

	Page		Page
Surega islets - - -	314	Taganilao point - - -	390
Suribao or Saru river - - -	385	Tagao island - - -	125
Surigao port - - -	303	Tagapula island - - -	346
——, tides - - -	304	Tagassan bay, tides - - -	206
—— strait - - -	302	Tagauayan island - - -	87
——, Guntuan passage - - -	307	Tagbilaran strait - - -	294
——, direc- tions	312	Tagil island - - -	265
——, pilots - - -	307	Tagipil island - - -	164
——, tides - - -	308, 310	Tagiran point - - -	340
——, winds - - -	311	Tago Sungai island - - -	428
Suruaki island - - -	452	Tagolo point - - -	320
Surveys, want of - - -	1	Tagonito point - - -	308
Swirl patch - - -	215	Taguan bay - - -	341
		Tagubanhan island - - -	266
		Taguisian point - - -	393
		Tagulanda island - - -	414
		Tagun bay; Luzon island - - -	377
		—— river; Davao gulf - - -	407
		Taguntun point - - -	379
		Tagusan point - - -	231
		Taguta islet - - -	107
		Tahing Tahing village - - -	126
		Tahuruk point - - -	224
		Taikola island - - -	105
		Taiyuan shoal - - -	537
		Taja islands - - -	142
		Tajando islands - - -	471
		Tajao bank - - -	278
		—— point - - -	278
		Tajud point - - -	231
		Takbubuk island - - -	87
		Takloban town - - -	297, 362
		Taktagan islet - - -	122
		Taku shoal - - -	344
		Takut Buansa - - -	114
		—— Kadiajan - - -	120
		—— Langon - - -	119
		—— Mataha - - -	134
		—— Pabunuan - - -	107
		—— Parido - - -	396
		—— Suligan - - -	110
		—— Sungu; Samales island - - -	109
		—— ; Siassi island - - -	119
		Talabasi point - - -	74
		Talabe, coal outcrop - - -	275
		Talabu cape - - -	428
		—— island - - -	428
		Talagi point - - -	226
		Talaguilong port - - -	320
		Talajit island - - -	346
		Talamtan bank - - -	143
		Talamuru point - - -	455
		Talauer islands - - -	5, 409
Taal town, telegraph - - -	222		
Taam island - - -	471		
Tabagon bay - - -	281		
Tabak rocks - - -	88		
Tabako bay - - -	381		
—— town - - -	382		
Tabango bay - - -	228		
Tabar island - - -	485		
Tabauwan island - - -	197		
Tabawan island, anchorage - - -	126		
Tabello islands - - -	441		
Tabiauan river - - -	103		
Tabiki point - - -	232		
Tabin Chico bay - - -	227		
—— Grande bay - - -	227		
Tablas island - - -	236		
Table head - - -	531		
—— mountain - - -	217		
Tabo cape - - -	442		
Tabok island - - -	298		
Tabon islet; Bohol island - - -	224		
—— point - - -	274		
Tabonan point - - -	321		
Tabú point - - -	317		
Tabuan islands - - -	127		
Tabukan road, village - - -	413		
Tabulunga island - - -	129		
Tabun point - - -	238, 258		
Tabunan point - - -	344		
Taebun channel - - -	377		
Tagabua islet - - -	195		
Tagampul islets - - -	347		
Taganak island - - -	166		
—— patches - - -	166		

	Page		Page
Talauer islands, anchorage - - -	410	Tanglao river - - -	53
Talayan point - - -	403	Tanguingui islet; Burias island -	336
Talc head - - -	558	-----; Masbate island -	257
Taliabu island - - -	439	Tangular point - - -	376
Talikut island - - -	406	Tangusu bay - - -	173
Talin bay - - -	69	-----, rock - - -	173
----- point - - -	69	Tanj Bungaan - - -	161
Talisay point; Masbate, W. coast -	255	Tanjong Aros - - -	416
----- village; Sebu, E. coast -	286	----- Bain - - -	481
Talisaya point - - -	240	----- Bohoi - - -	418
Talisse island - - -	416	----- Bung - - -	416
----- road - - -	417	----- Labian - - -	176, 183
-----, shoals - - -	417	-----, tidal streams near -	176
-----, clearing mark -	417	----- Niug - - -	167
-----, supplies - - -	417	----- Oba - - -	429
-----, tides - - -	417	----- Pandaras - - -	166
Talkauayan bay - - -	333	----- Papat - - -	169
Talong islet - - -	299	----- Siasib - - -	162
Talonuo island - - -	441	----- Sidongal - - -	139
Taluk island - - -	119	----- Tando-cao - - -	94
Tamar point - - -	551	----- Tavo Tavo - - -	94
Tambagaan island - - -	125	----- Timbu Mata - - -	199
Tambang point - - -	376	----- Tokabene, beacon - - -	425
Tambaran isle - - -	233	----- Unsang - - -	175
Tambatan point - - -	395	Tankan islet - - -	129
Tambuluanga island - - -	131	Tankolaluan islet - - -	125
Tambisan island - - -	173	Tankuiki rock - - -	118
----- peak - - -	173	Tanna Ballu mount - - -	128
Tambobo point - - -	52	----- pulo - - -	127
Tambog point - - -	388	Tanobon island - - -	79
Tamboloton bay - - -	287	Taön point - - -	289
Tambon shoal, buoy - - -	286	----- strait - - -	274
Tambove road - - -	53	-----, South entrance -	279
-----, directions - - -	53	-----, tidal streams -	279
Tambu island - - -	221	Tantanang bay - - -	394
Tambulan island; Sulu island -	118	Tantaauyan hill - - -	279
----- reefs; Mallawallé East		Tantuan - - -	334
----- dangers - - -	162	Taona point - - -	430
Tameai or Jef-fam islands - - -	503	Tapaan island - - -	123
Tamedaan village - - -	473	----- passage - - -	123
Tameti island - - -	435	----- shoal - - -	124
Tamilan village, reef - - -	460	Tapi island - - -	435
Tampa Tampa island - - -	131	Tapian mountain - - -	328
Tamuk island - - -	108	----- point - - -	400
Tanao islets - - -	374	Tapiantana channel - - -	109
Tandag point - - -	387	----- islands - - -	108
Tandas bank - - -	255	Tapul islands - - -	118
Tandikan point - - -	118	-----, tides - - -	118
Tando Bulong passage - - -	205	Tara island; Kalamianes island -	80
Tandu point - - -	118	-----; Siassi island - - -	119
Tandubas island - - -	132	Tarakan mount - - -	441
Tandubato island - - -	130	Tarigtig points - - -	370
Tangao islet - - -	135	Tarlac reef - - -	374

	Page		Page
Taruk island - - - -	130	Teonabal bank - - - -	140
Taruna bay, town - - -	412	----- island - - - -	140
Tataan (or Simalak) islands	137	Tepa anchorage - - - -	492
----- port - - - -	138	Terbang island - - - -	488
-----, anchorage - - -	138	Ternate channel - - - -	433
-----, Basun channel - -	139	----- island - - - -	432
-----, directions - - -	138	-----, tides, weather -	433, 574
-----, Nusa Takbu channel -	138	----- town - - - -	432
-----, Western channel -	139	-----, anchorage - - -	432
-----, tides - - - -	138	-----, coal - - - -	433
Tatagan island - - - -	201	-----, supplies - - - -	432
Tatalan island - - - -	109	Tetapaan islet - - - -	426
Tatas islands - - - -	447	Tetas de Katsingan - - -	345
Tatingar point - - - -	514	----- Santa - - - -	46
Tau island - - - -	488	Teumabal island - - - -	117
Tawali island - - - -	436	Third Passage island - - -	508
Tawao, from Friedrich haven, direc-		Thres Brothers islands; Banda sea	471
----- tions - - - -	218	----- islets; Amboina -	462
----- river - - - -	215	----- Capes peninsula - -	514
-----, tides - - - -	216	----- fathoms bank - - -	100
----- settlement - - -	215	----- Peaks mount - - -	290
Tawi Tawi bay - - - -	136	Threshold bay and point -	510
----- group - - - -	124	Thumb hill - - - -	134
-----, tides - - - -	128	Thursday island - - - -	28
-----, winds - - - -	136	Thurston islet and rocks -	374
----- island - - - -	128	Tiabu river - - - -	441
----- islet - - - -	114	Tiain point - - - -	404
Tay Tay; Palawan - - -	78	Tiandu islands - - - -	471
Tayabas bay - - - -	325	-----, dangers near - -	471
----- province - - - -	332	Tibakkan cay - - - -	162
----- river - - - -	325	Tibao point - - - -	231
Taytay point; Leite - - -	303	Tibi point - - - -	381
Tegal shoal - - - -	473	Tibiao town - - - -	239
Tegang islet - - - -	413	Tidal streams, Alice channel	181
Tehoru anchorage - - -	460	-----, Arafura sea - - -	523
Teinga island - - - -	106	-----, Aru islands - - -	477, 480
----- Laguit island - - -	108	-----, Balabac strait -	84, 147
Teingolan island - - - -	105	-----, Balanguingui islands	110
Teipono island - - - -	105	-----, Balayan bay - - -	222
Teka point - - - -	275	-----, Banda isles - - -	463
Telegrnaf rock - - - -	471	----- sea - - - -	469
Telegraphs - - - -	30	-----, Banka strait - - -	420
Telok Berau - - - -	513	-----, Basilan strait - -	84, 98
----- Bukan - - - -	186	-----, Batu Tinat - - -	216
Teluti bay - - - -	460	-----, Bongno port - - -	124
Temerario rock - - - -	90	-----, Borneo, N.E. coast -	146,
Temontangis mount - - -	115	147, 171, 173, 175, 176,	
Templer islet - - - -	527	181, 211.	
Templo islet - - - -	335	-----, Brisbane reef; Ser-	
Ten-feet rock; Banguey South		watti island - - - -	491
channel - - - -	157	-----, Clarence strait -	547
Tenga island - - - -	451	-----, Dalaguete point -	288
Tenimber (Timor Laut) islands	10, 493	-----, Dampier strait -	503

	Page		Page
Tidal streams, Darvel bay -	183	Tidal streams, Verde island passage	83, 221
-----, Dok-kan island -	141	-----, Wetta island -	487
-----, Dourga strait -	522	Tides, Borneo, N.E. coast -	146
-----, Dundas strait -	536	-----, China sea -	26
-----, Friedrich haven -	214	-----, Philippines -	27, 565
-----, Gisser island -	459	-----, tables, for finding the time	
-----, Iloilo strait -	268	and height of high water at ports	
-----, Isabela port -	105	in the Philippines -	566
-----, Jintotolo channel -	261	Tidore island -	434
-----, Kamiguin island -	315	Tifori island -	427
-----, Kamotes islands -	300	Tifu bay -	453
-----, Laminusa anchorage	120	Tiga islet -	150
-----, Ligitan channel -	211	Tigabu island -	162
-----, Limasana island -	301	-----, tides -	171
-----, Luzon, East coast -	380	Tigbaon islands -	392
-----, South coast -	331	Tigdos islet -	388
-----, Mallawallé channel -	171	Tiguilabun island -	107
-----, Marie shoal -	550	Tiguma point -	397
-----, Masbate and Samar,		Tigungan island -	130
between -	346	Tiji Tiji bank -	133
-----, Masingluk anchorage	100	Tikala islands -	396
-----, Mindoro strait -	78, 84	----- river; Manado bay -	425
-----, Money shoal -	525	Tikao island -	340
-----, Panay, North coast -	260	Tiklin islands; San Bernardino strait	349
-----, Ragay gulf -	335	----- point; Mindoro, E. coast -	232
-----, Romblon channel -	248	-----; Negros, E. coast -	274
-----, St. Asaph bay -	551	----- shoals -	349
-----, Samboanga road -	98	----- strait; San Bernardino strait	349
-----, San Bernardino strait	356	Tiktavun island -	92
-----, Juanico strait -	361	Tikul island -	141
-----, Sarangani cape -	403	Tilat town -	242
-----, Sebu sea -	226	Tilig port -	71
-----, Selé strait -	509	-----, anchorage, supplies -	71
-----, Sentry bank -	175	-----, tides -	71
-----, Sibutu passage -	84, 177	Timakawa district -	521
-----, Sikijor island -	296	Timako hill -	399
-----, South Ubian -	128	----- island -	400
-----, Sulu sea -	83	Timba Timba islet -	203
----- and Tawi Tawi		Timbang island -	169
islands -	128	Timbu Mata island -	198
-----, Surigao strait -	310	----- tanjong -	199
-----, Tabako bay -	382	Timbungan island -	108
-----, Tagolo point -	320	Time signals, Manila -	68
-----, Talisse road -	417	-----, standard -	28, 68
-----, Tañon strait -	275, 279	Timor island -	489
-----, Tapiantana channel -	109	----- Laut island -	10, 493
-----, Tapul islands -	118	----- or Arafura sea -	523
-----, Tikao and Masbate,		----- point; Ceram island	456
between -	342	Timoraka district -	521
-----, Trusan Tando Bulong	205	Timpasan island -	359
-----, Usang peninsula	174, 176	Tinaan anchorage -	287
-----, Utanata river -	520	----- point -	287
-----, Van Diemen gulf -	536		

	Page		Page
Tinaga islet - - - -	374	Troubadour shoal - - -	524
Tinagbud river - - -	384	Trueno shoal - - - -	368
Tinaguitan bay - - -	353	Trusan Bongao - - -	134
Tinaka point - - - -	403	----- island - - -	136
-----, anchorage - -	403	----- Duyon - - - -	169
Tinakos islet - - - -	339	----- Tando Bulong - -	205
Tinakta island - - - -	137	-----, directions - -	206
Tinalisayan islets - -	336	----- Treacher - - -	205
Tinang islet - - - -	248	Tual harbour - - - -	474
Tinangasan point - - -	358	-----, directions - -	474
Tindila island - - - -	417	Tuankan point - - - -	301
Ting-kaiu river - - -	194	Tuat islet - - - - -	259
Tinkalan rock - - - -	119	Tub Bataha reefs - - -	90
Tintiman island - - -	235	Tuban islet - - - - -	453
Tinuibo islet - - - -	290	Tubig Mangayao point -	326
Tipin road - - - - -	506	Tubigan island - - - -	140
Toba island - - - - -	477	Tubile point - - - - -	74
Toe point - - - - -	505	Tubingatan point - - -	115
Tokabene point, beacon	424	Tubotubo island - - -	401
Tokanhi point - - - -	139	Tubu anchorage - - - -	389
Toko - - - - -	47	Tubud point - - - - -	320
Tolan point - - - - -	121	-----, light - - - -	320
Tolibas river - - - -	183	Tuburan river - - - -	278
Tolon anchorage - - -	273	Tubu-tubu island - - -	130
----- Pisa island - -	108	Tuft point - - - - -	511
Tolonuo island - - - -	441	Tugas point - - - - -	208
Tomahu islands - - - -	451	Tugu islands - - - - -	455
----- mountain - - -	450	Tugubun point - - - -	390
Tomasa islet - - - - -	346	Tuguian point - - - -	327
Tomonton point and shoal	267	Tugus point - - - - -	307
Tomra village, anchorage	490	Tuiaan anchorage - - -	287
Ton Kanutyajan point -	94	Tukapanga point - - -	403
Tongo point - - - - -	295	Tukat bank - - - - -	260
Tong-Tong bank - - - -	115	Tuk-Tuk point - - - -	112
Tonkian islets - - - -	130	Tukuran town - - - -	397
Tonkil island - - - - -	110	Tulian island; Dalrymple island -	111
----- point - - - - -	388	-----; Sulu island, W. coast	114
Torana point - - - - -	466	Tulnalutan island - - -	100
Torongohok islet - - -	167	Tulunanaun islet - - -	261
Torres strait - - - - -	523	Tumadgo point - - - -	321
Tortuga bank - - - - -	54	Tumajubun point - - -	106
Towa island - - - - -	460	Tumalaytay islet - - -	254
Tower hill - - - - -	486	Tumalung bay - - - - -	394
Trangan island - - - -	481	Tumanao port - - - - -	404
Trapihihan point - - -	329	Turango bay or Dilasak -	370
Treacher channel - - -	205	Tumbu Tumbu islet - - -	518
Trepang bay - - - - -	534	Tumbukan islet - - - -	133
Tres Reyes islands - - -	331	Tumindao island - - -	178
Triton bank - - - - -	521	Tuna bay - - - - -	401
----- bay - - - - -	518	Tundalara mount - - - -	80
-----, tides - - - - -	519	Tuukalan island - - - -	110
----- island - - - - -	395	Tunku point - - - - -	184
----- rocks - - - - -	308	----- river - - - - -	184

	Page		Page
Tunku shoal, caution	184	Utabe bay	840
Turia rock	266	Utanta river	520
Turner patch	185	———, tides	520
Turret island	72	Utu islet	445
Turtle islands; Banda sea	470	Uwaan island	142
———; New Guinea, W. coast	512		
——— point	531		
Turtur Juring	484	Valentia isle	526
Tutop tanjong	207	Valparaiso shoal	92
Tutu bay	117	Valsche or False cape	522
——— point	117	Van Diemen cape	550
Twin cliffs	553	——— gulf	536
Twins islets	306	——— Speyk reef	475
Two-peaks mount	314	Vansittart bank	505
Typhoons	18	Vantay point	316
———, practical rules	20	Varadero bay	222
———, table of	21	Vari island	853
———, warnings of approach	20	Vasey river	362
		Vasbon head	530
		Veldman rock	444
Uafu Fenjuring point	484	Verbrandt point	422
Uaidajon islet	262	Verde island	225
Uanivan islet	390	——— passage	221
Uarai Vanoa rocks	358	———, directions	232
Ubian island, North	140	——— to Iloilo, directions	270
———, South	127	Vergara river	405
Ubur island	474	Vernon channels	547
Udlud point	280	———, directions	547
Uga Yef	443	———, tidal streams	547
Ujir island	478	——— islands	545
Uki island or Lota	453	Vetter Pisani islands	512
——— road	453	Victoria settlement; port Essington	532
Ular point	478	——— shoal; Arafura sea	524
Uling coal mine	288	———, current	524
Ultra island	131	———; Van Diemen gulf	537
Ulu anchorage	414	Vienna islands	512
Umanum point	387	Vigan gap	45
Ume or Pigot point	501	——— road	45
Umirey river	371	———, directions	45
Unamao islet	308	Vigia mount	257
Unarang rock	220	——— point; Leite	362
Uniform system of buoyage; Nether-		———; Masbate	345
lands East Indies	40	Vilanvilan island	100
Uniform system of buoyage; Philip-		Villamil rock	117
pine islands	40	Vinas river	333
Unip islets	305	Viola reef	93
Unisan islets	244	Virginia settlement	557
Uran island	460	Vitali point	392
Urobie islet	518	Vivien island	509
Uru Langura or Triton bay	518	Vlakke point	520
Usada island	141	Vlaming island	446
Uson bay	344		

	Page		Page
Voorwyk reefs, beacons - - -	187	Wayameli point - - -	441
Vordate island - - -	494	Wayo reef - - -	452
Vulan island - - -	517	Webb shoal - - -	203
Vuil island - - -	505	Weda bay and islands - - -	443
		— road - - -	443
Wahadan point - - -	472	Wedge island - - -	509
Wahai bay - - -	455, 474	Wednar point - - -	472
—, directions - - -	455	Weg island - - -	508
—, tides - - -	456	Wellington, fort - - -	522
Wai islet - - -	467	Wessel cape - - -	523
— Apu river - - -	452	West Aligator river - - -	540
— Pelau anchorage - - -	451	— arm; port Darwin - - -	537
Waigiu island - - -	498	— bank; Manuk Manukan - - -	92
— sea - - -	502	— bay; port Essington - - -	532
Wailutu anchorage - - -	495	— Brother island - - -	512
Waisamu anchorage - - -	461	— harbour; Selé strait - - -	509
Waison islet - - -	501	— islands; Segaar bay - - -	514
Wakaholo lake - - -	450	— islet; Mallawallé island - - -	138
Walford point - - -	531	— Peron island - - -	564
Wallace channel - - -	494	— point; port Darwin - - -	556
— mount - - -	491	— Stewart peak - - -	194
Walorjin channel - - -	484	Wetan island - - -	492
Walton reefs - - -	197	—, anchorage - - -	492
Wammer island - - -	478	—, coal, supplies - - -	492
Wamuka river - - -	520	Wetta island - - -	486
Wanai islet - - -	484	Whale rock - - -	308
Wanderer reef; Darvel bay - - -	191	Wheeling peak - - -	371
— shoal; Borneo, N.E. coast - - -	160	White cliff - - -	455
Wanganui rock - - -	554	— rock; Aru islands - - -	482
Wangit village - - -	478	—, Cayo island, South-ward of - - -	88
Wanjewanja cove - - -	533	—, Kiniluban isles - - -	85
Wanumbai strait - - -	480	—, Samatti - - -	507
— Sungi - - -	485	Wiang island - - -	446
Ward point - - -	545	Wilcox bank - - -	95
Warialau island - - -	477	Wildman river - - -	540
Wariari island - - -	495	Wilhelmina reef - - -	108
Warir island - - -	509	Wilhelmus bay - - -	488
Waru - - -	457	William reef - - -	470
— bay - - -	457	Winchester bank - - -	444
Wasir island - - -	477	Winds and weather, general remarks - - -	12, 17
Wass islet - - -	514	Amboina - - -	465
Watergeus reef - - -	495	Arafura sea - - -	16
Watson island - - -	509	Aru islands - - -	476
Watteweh road - - -	493	Australia, North coast - - -	17
Watubela island - - -	459	Banda islands - - -	466
Watulei islands - - -	485	— sea - - -	16
— Sungi - - -	485	Bauka strait - - -	424
Waurili anchorage - - -	489	Basilen strait - - -	98
—, directions - - -	489	Borneo, N.E. coast - - -	14, 144
Wayam islet - - -	501	Buru island - - -	450
		Celebes sea - - -	14
		Ceram island - - -	454

	Page		Page
Winds and weather, Ceram sea	- 15	Winiu island	- 471
China sea	- 13	Wise hill	- 190
Dampier strait	- 503	Wokam island	- 478
Darvel bay	- 182	Wolf rock	- 435
Darwin port	- 562	Wolil island	- 489
Ké Dulan	- 474	Wolwa island	- 485
Lingayen gulf	- 48	Wood rock	- 547
Luzon island, East coast	- 380	Woodford shoals	- 504
South coast	- 332	Woodhall reefs	- 189
S.W. coast	- 13	Workai island	- 483
Manila bay	- 66	Worra island	- 442
Mindanao, North coast	- 322	Wossa bay	- 441
Mindoro strait	- 78	road	- 449
Molucca passage	- 15	Wullerstorf mount	- 208
sea	- 15	Wyatt mount	- 195
New Guinea, North coast	- 512		
West coast	- 17, 497		
North of the Equator	- 18		
Philippines, The	- 13	Yamdena or Timor Laut island	- 10, 493
gales	- 22	Yowl or Aiu islands	- 498
Pollok harbour	- 398	Yuisan point	- 289
Rainy seasons	- 18	shoal	- 289
San Bernardino strait	- 355	Yukatan anchorage	- 390
South of the Equator	- 18		
Sulu sea	- 14, 82		
Surigao strait	- 311		
Tawi Tawi island	- 136	Zapatos islands	- 260
Ternate	- 433	Zau island	- 142
Typhoons	- 15	Zumarraga	- 361

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